SEPTEMBER 1952 — FIFTY-NINTH YEAR

MACHINERY



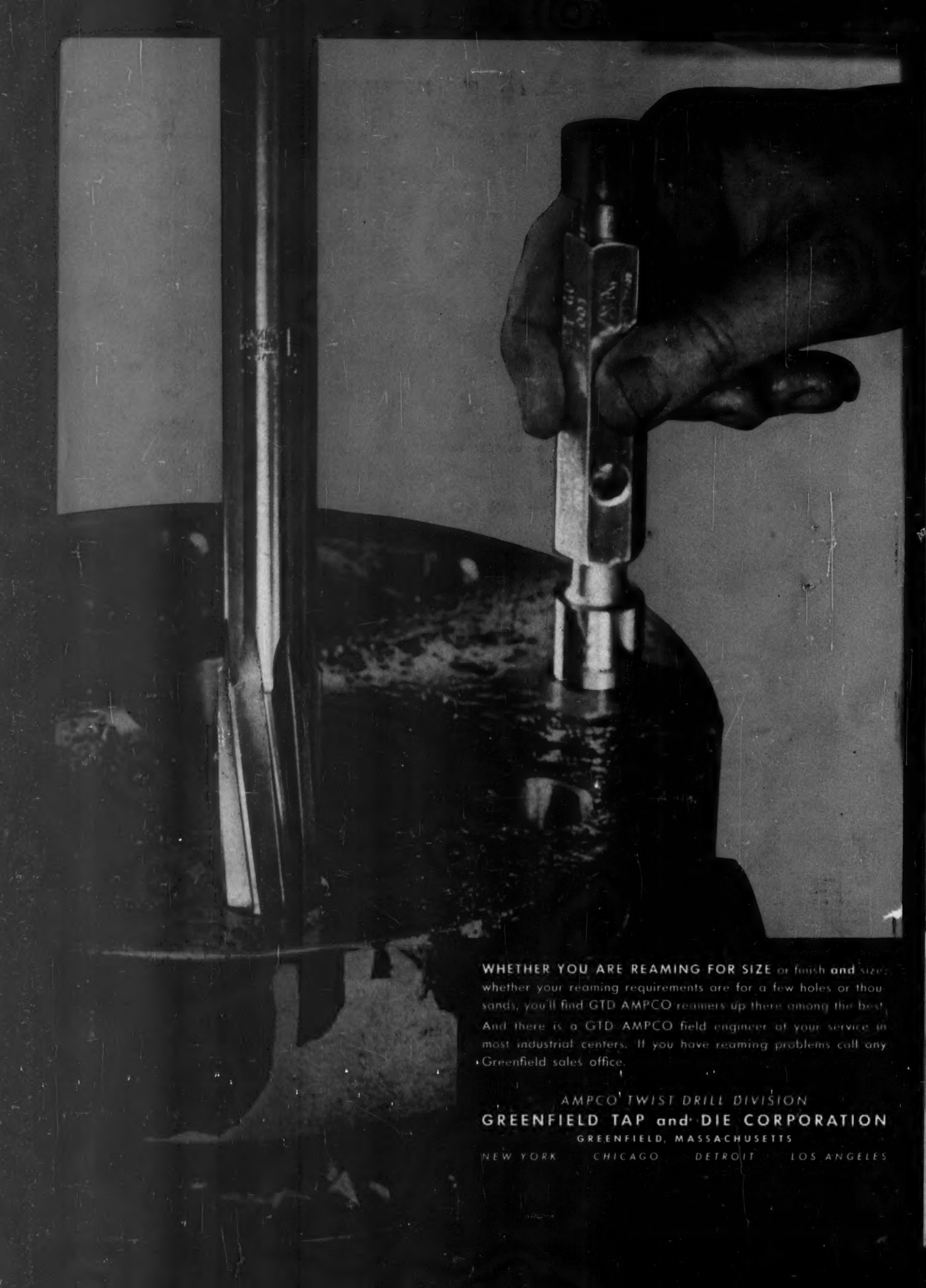
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MACHINERY

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Need Help on

LANDIS ENGINEERS METHODS FOR



1. (Above): A 1½" LANDMACO double spindle machine engineered for threading of V-Belt sheaves is equipped with a 1½" LANCO Head for external threading and a 3ALT tap for internal threading. The complete threading requirements for the work piece are accomplished by one machine and one operator, therefore reducing labor and handling costs.

2. (Right) A special Collapsible Tap used to thread 12" to 18" valve bodies for seat ring insertions. Landis Valve Seat Taps are individually engineered for their particular usage and are supplied to tap valve bodies ranging from the 2" to the 24" size.

4. (Right): A LANCO Taper Cutting Head designed for producing tapered threads up to 2¼" in length and to unusually close tolerances. The die head can be converted to cut a reverse taper by the simple application of a reverse taper cam. Diameters from ½" to 2" and tapers ranging from zero to 2" per foot can be cut with this LANDIS Head.

LANDIS *Machine*

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS

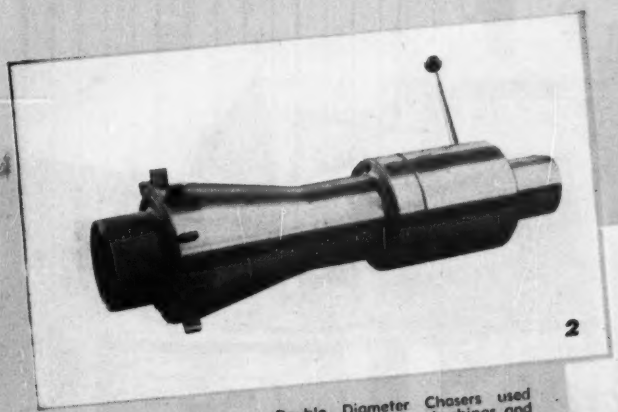
Difficult Threading Jobs?

DEVISE SPECIAL EQUIPMENT AND "HARD-TO-THREAD" WORKPIECES

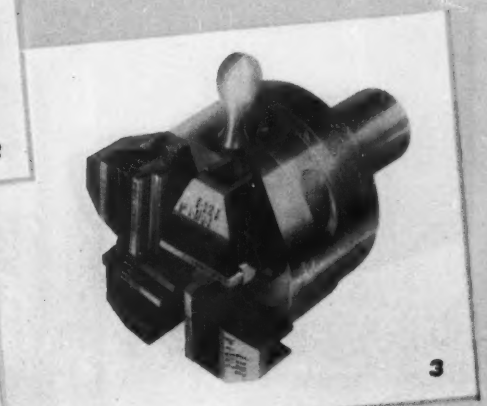
Don't let the production of an unusual thread hinder an otherwise efficient manufacturing process. Hundreds of companies are today, with *LANDIS* equipment, profitably generating threads formerly considered impossible or too costly for practical operation.

We offer to all manufacturers aid in solving problems in all phases of thread production. We will consult on the original design to insure that the proper thread to best serve a particular function is employed; we will advise as to the best standard equipment to produce a specific thread; we will develop special tooling for the production of an unusual or difficult thread; we will design special holding fixtures for threading workpieces that are difficult to chuck; or we will work out special methods to best fit multiple threading operations into the complete production process.

The illustrations show four examples of such Threading Problems solved by our Engineering Department. No matter what your Threading Problem—let our years of Thread Experience and Engineering Know-How work with you in its solution. Write or call *LANDIS* today.

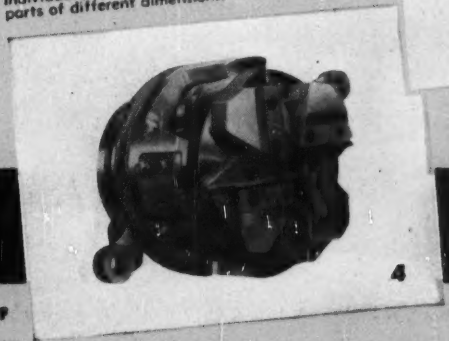


2



3

3. (Right): Double Diameter Chasers used to generate threads on reducing bushings and similar work pieces. These chasers cut threads on two different diameters simultaneously; thus, eliminating a second operation. Pitch and thread form for the two diameters must be identical and other limitations necessitate individually designed chasers for threading parts of different dimensions.



4

CO. OF

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WAYNESBORO PENNSYLVANIA

THREAD GENERATING EQUIPMENT

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Involute Measuring Machines
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"Red Liners" No. 8M & No. 20M

Lead Inspection Instruments
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.to reduce "Inspector" fatigue

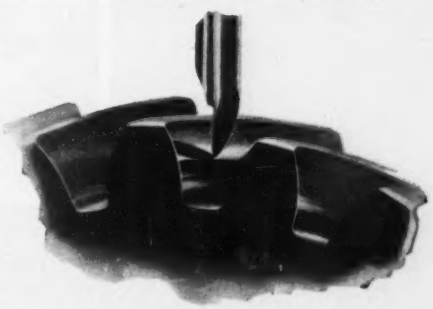


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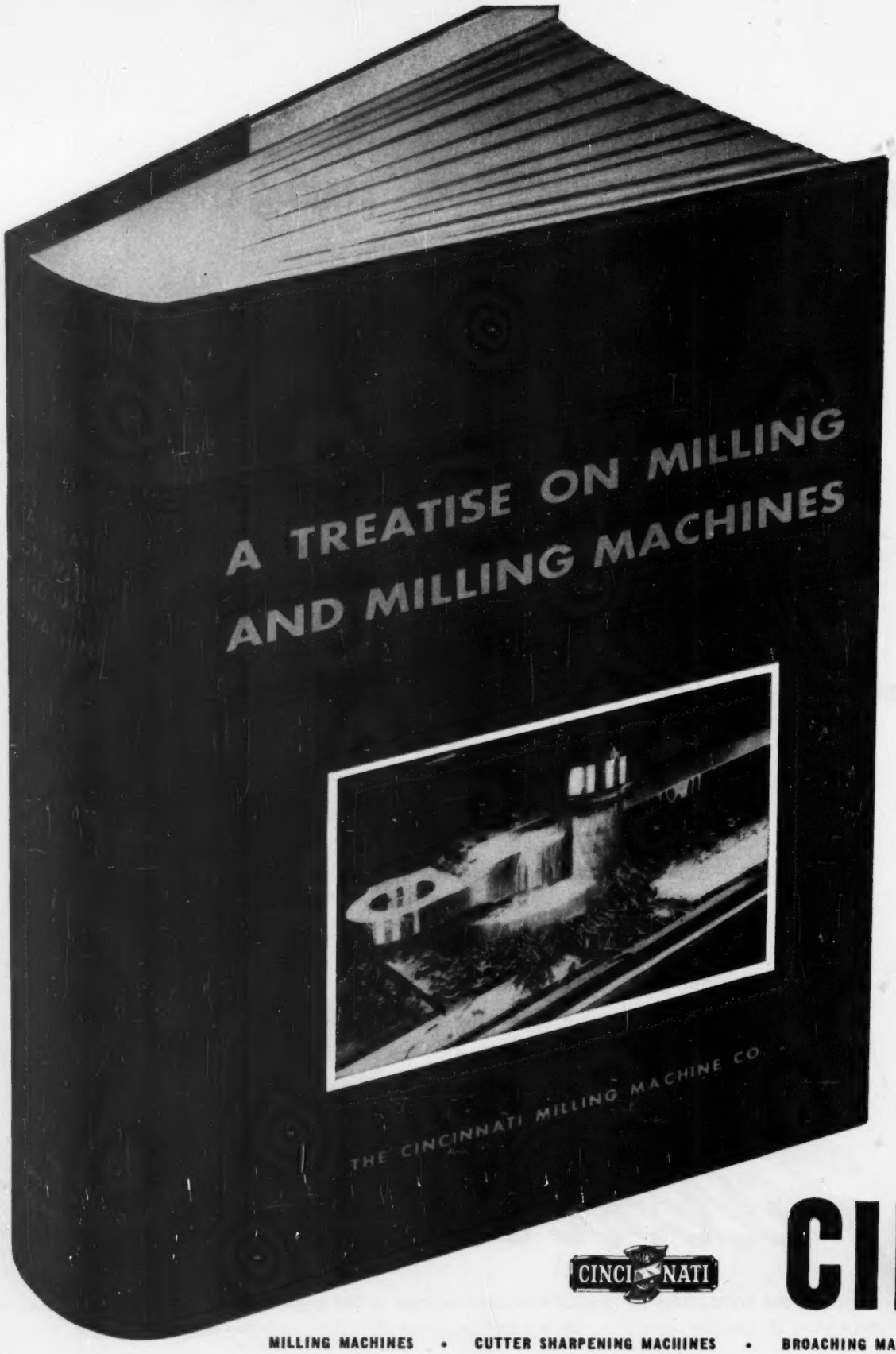
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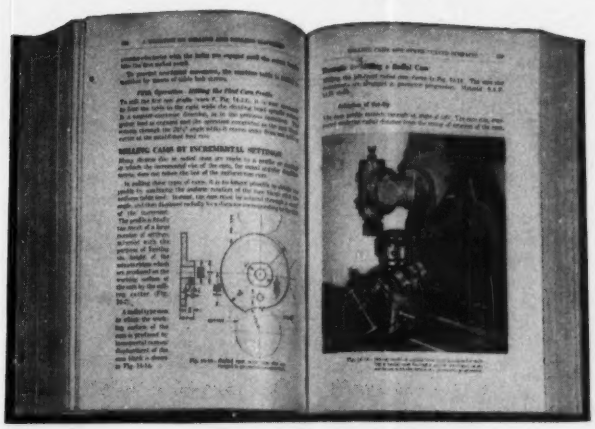
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4 Milling Cutter Materials
5 Milling Cutter Elements
6 Sharpening and Care of Milling Cutters
7 The Milling Process
8 Chip Formation, Surface Finish, and Cutting Fluids
9 Power Required in Milling
10 Mounting of Milling Cutters
11 The Milling Machine in Toolroom Work
12 The Use of Work Indexing in Repetitive Milling Operations
13 Milling of Helical Surfaces
14 Milling Cams and Other Surfaces of Curved Contour
15 Milling Dies, Molds, and Parts of Cylindrical or Irregular Contour
16 Diversified Uses of Milling Equipment in Toolroom Work and Inspection
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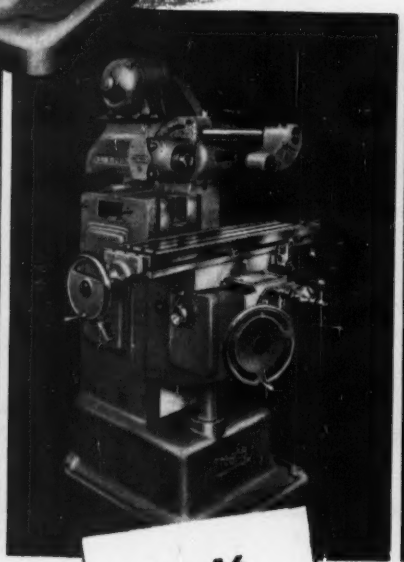
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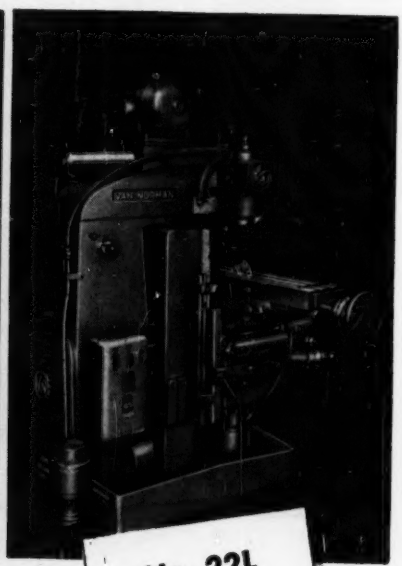
Milling Production Simplified



No. 12
Table: 37½" x 9¼"
Cutterhead in
Angular Position



No. 16
Table: 37" x 9½"
Cutterhead in
Horizontal Position



No. 22L
Table: 45" x 10"
Cutterhead in
Vertical Position

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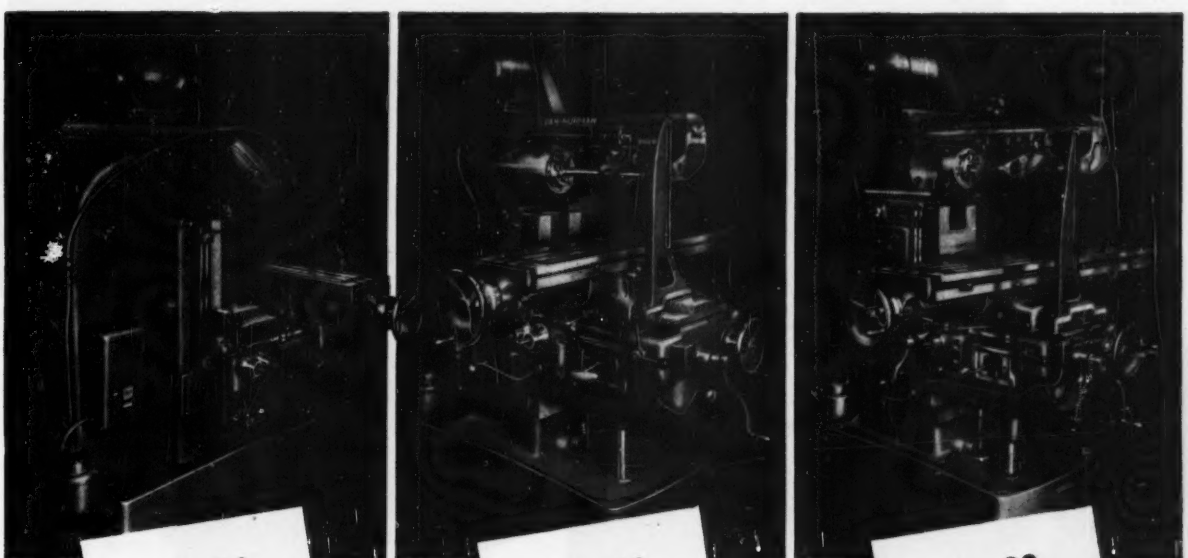
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All these features sum up to the highest output, fewest errors, lowest milling cost and machine maintenance. Find out how Van Norman Ram-Type Millers can save on your work. Write for catalogue.



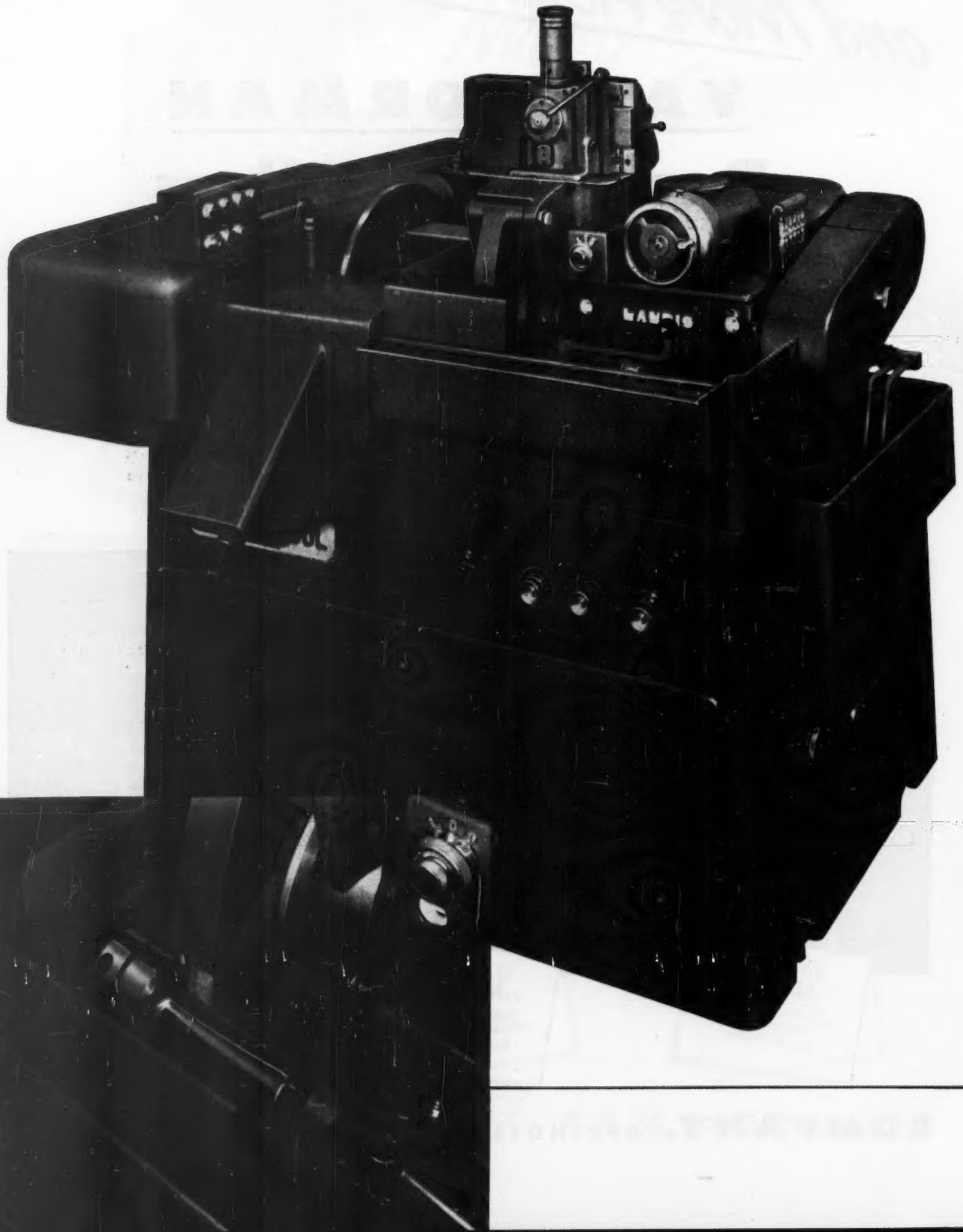
No. 26
Table: 58" x 13"
Cutterhead in
Angular Position

No. 36
Table: 64" x 14"
Cutterhead in
Horizontal Position

No. 38
Table: 64" x 14"
Cutterhead in
Horizontal Position

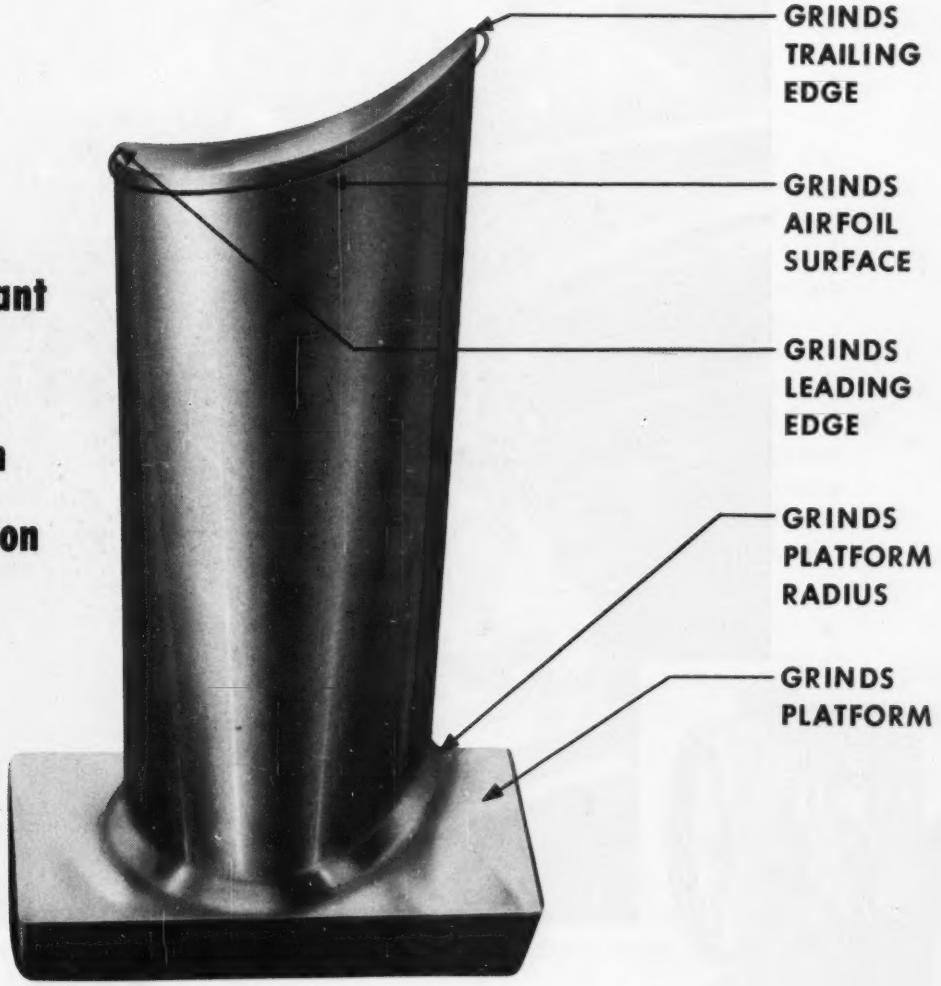
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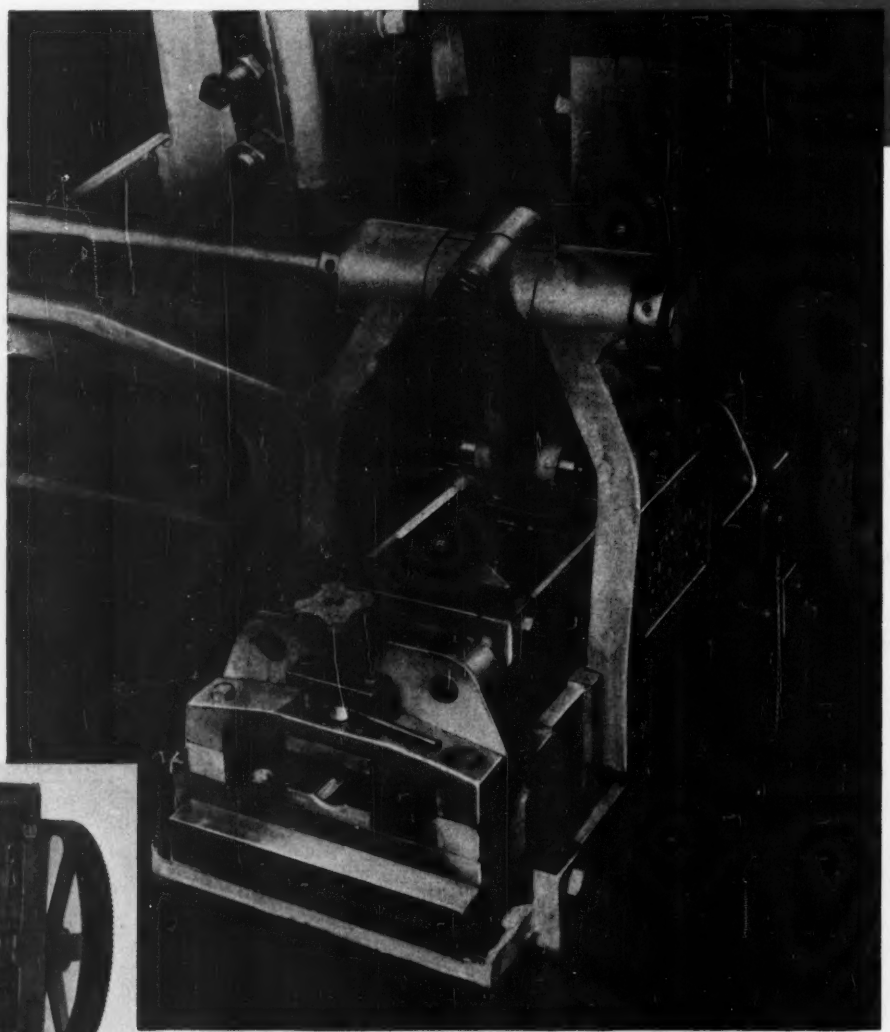
LANDIS

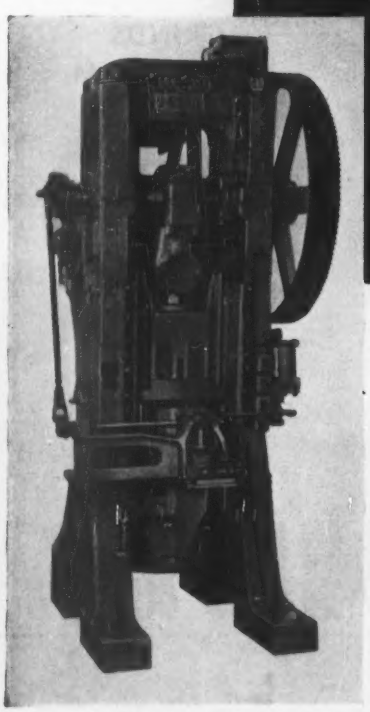
precision grinders

The close-up directly below shows U. S. Slide Feed arranged to accommodate 1 3/8" diameter bar stock mounted on press manufactured by the Cleveland Punch and Shear Works Co.

The lower illustration shows the complete press with U. S. Slide Feed and driving connections as it will be installed in the plant of The Metal Specialty Company in Cincinnati, Ohio.

U.S.





PRODUCTS

U.S. TOOL

Slide Feeds

Solve Your Press Room Problems

For Example... The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company, Cincinnati, Ohio, to furnish a number of their presses equipped with automatic feeds to feed 1 3/8" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, it was decided to use U. S. Slide Feeds.

Accuracy... With the set-up above described, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the 1 3/8" diameter bar stock into the die 3/4" at each stroke of the press, and the weight of the cut-off pieces varies less than 1 gram. With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.

Versatility... U. S. Slide Feeds are known for their accuracy in the feeding of flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross section. Also, in addition to metals, U. S. Slide Feeds can be used for the feeding of materials such as paper, plastic, mica, etc.

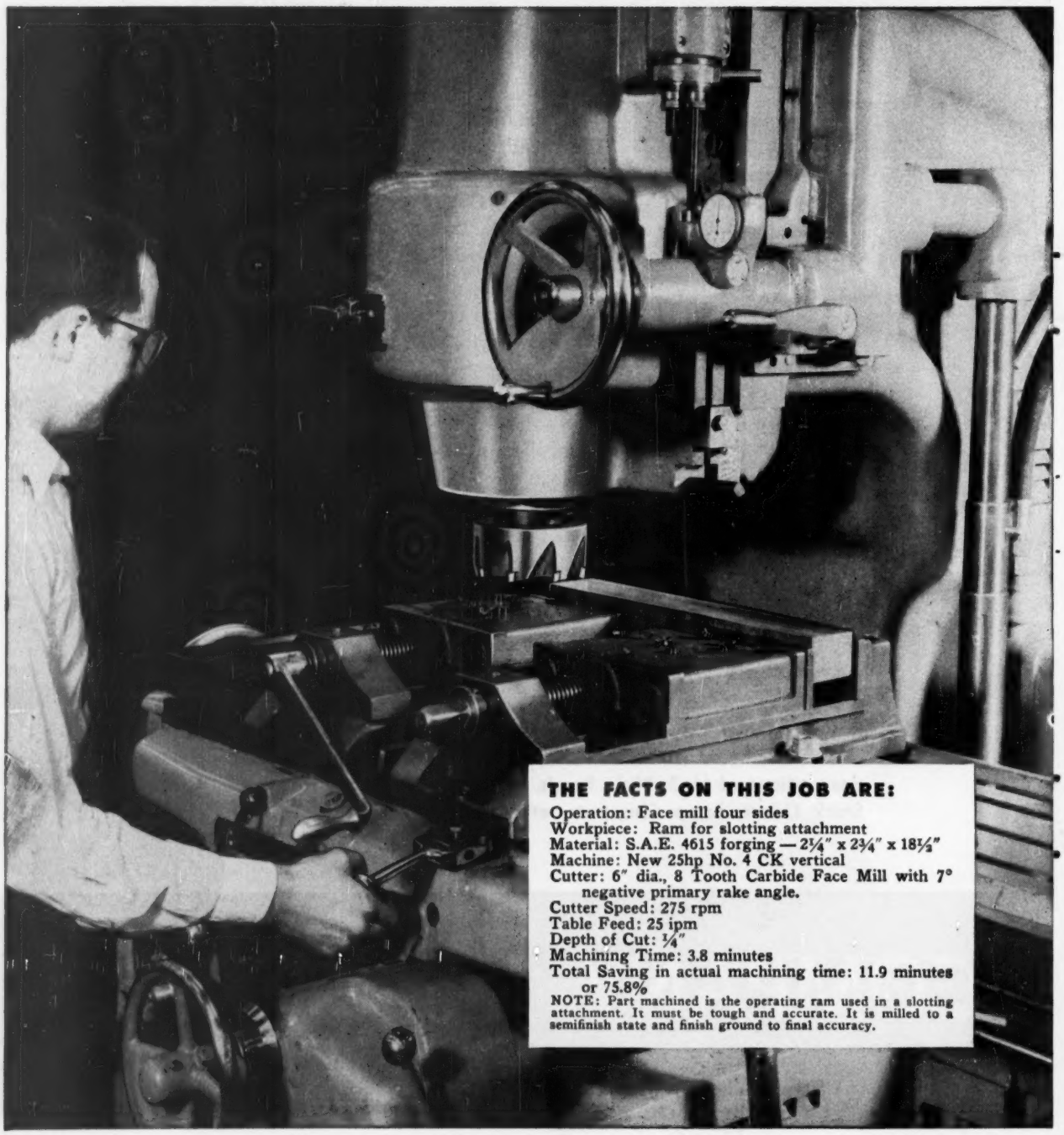
If you have a press feed problem, ask for a copy of Bulletin 80M on U. S. Automatic Press Room Equipment, which contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Choppers, etc.

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THE FACTS ON THIS JOB ARE:

Operation: Face mill four sides
Workpiece: Ram for slotting attachment
Material: S.A.E. 4615 forging — 2¼" x 2¾" x 18½"
Machine: New 25hp No. 4 CK vertical
Cutter: 6" dia., 8 Tooth Carbide Face Mill with 7° negative primary rake angle.
Cutter Speed: 275 rpm
Table Feed: 25 ipm
Depth of Cut: ¼"
Machining Time: 3.8 minutes
Total Saving in actual machining time: 11.9 minutes or 75.8%

NOTE: Part machined is the operating ram used in a slotting attachment. It must be tough and accurate. It is milled to a semifinish state and finish ground to final accuracy.

KEARNEY & TRECKER MILWAUKEE

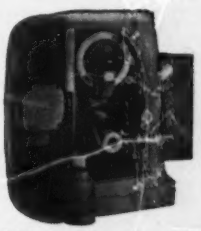
CK MILLING MACHINE PRODUCTION TIME 75%

4615 ALLOY STEEL FORGING MILLED IN 3.8 MINUTES . . . FORMER TIME 15.7 MINUTES

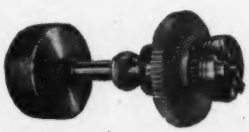
C-K MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER



Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.



New CK machines have Greater Horsepower. On this job, 25hp permitted operator to get maximum production from his modern cutter.

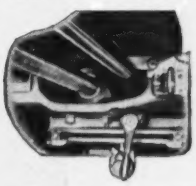


CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

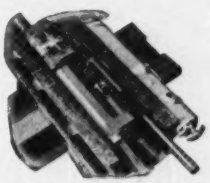




The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from 3/8" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.



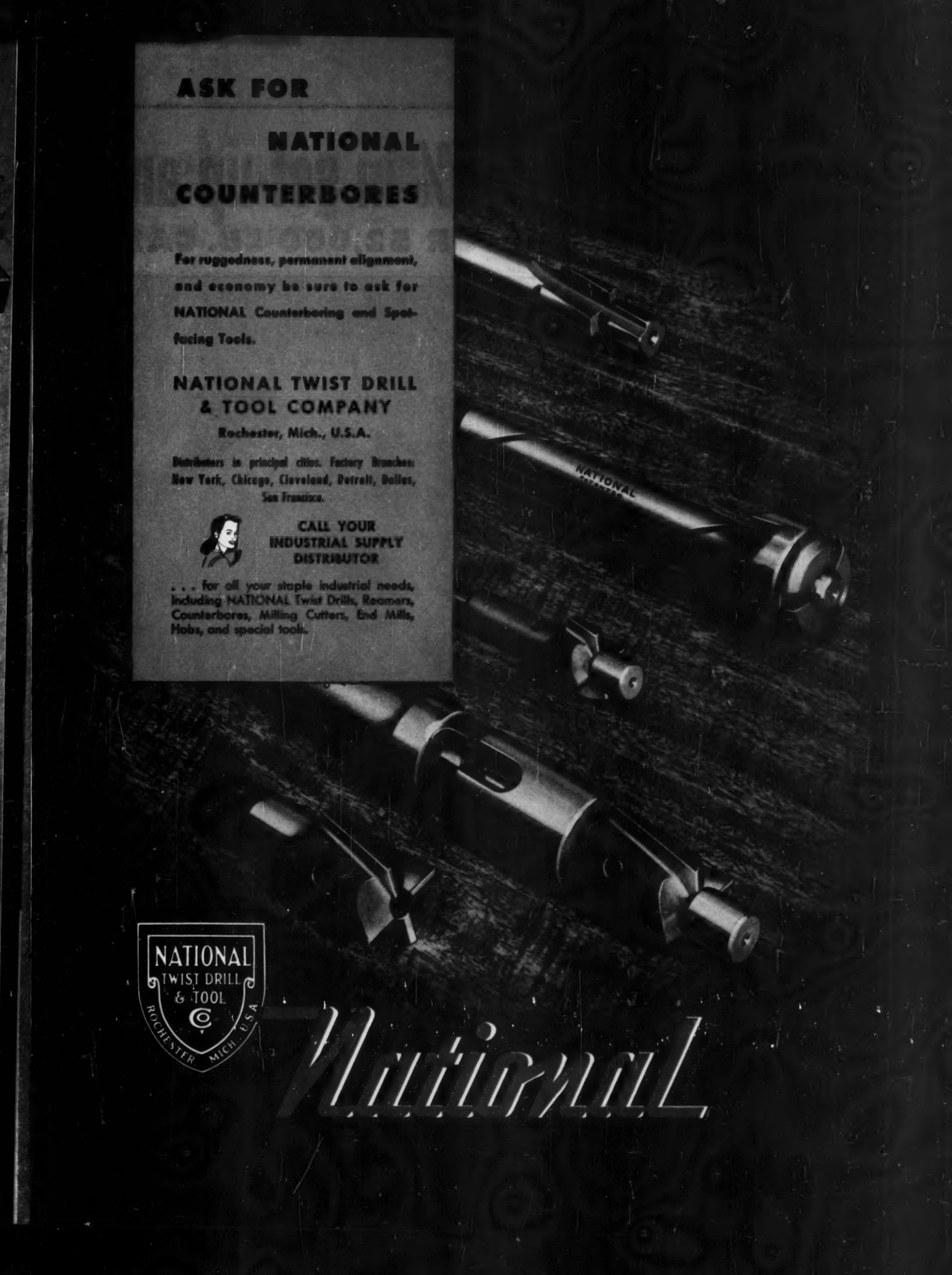
CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed performance and sustained accuracy.



CK's positive lubrication plus generously proportioned gears and shafts assure cool, trouble-free operation under heaviest load conditions.

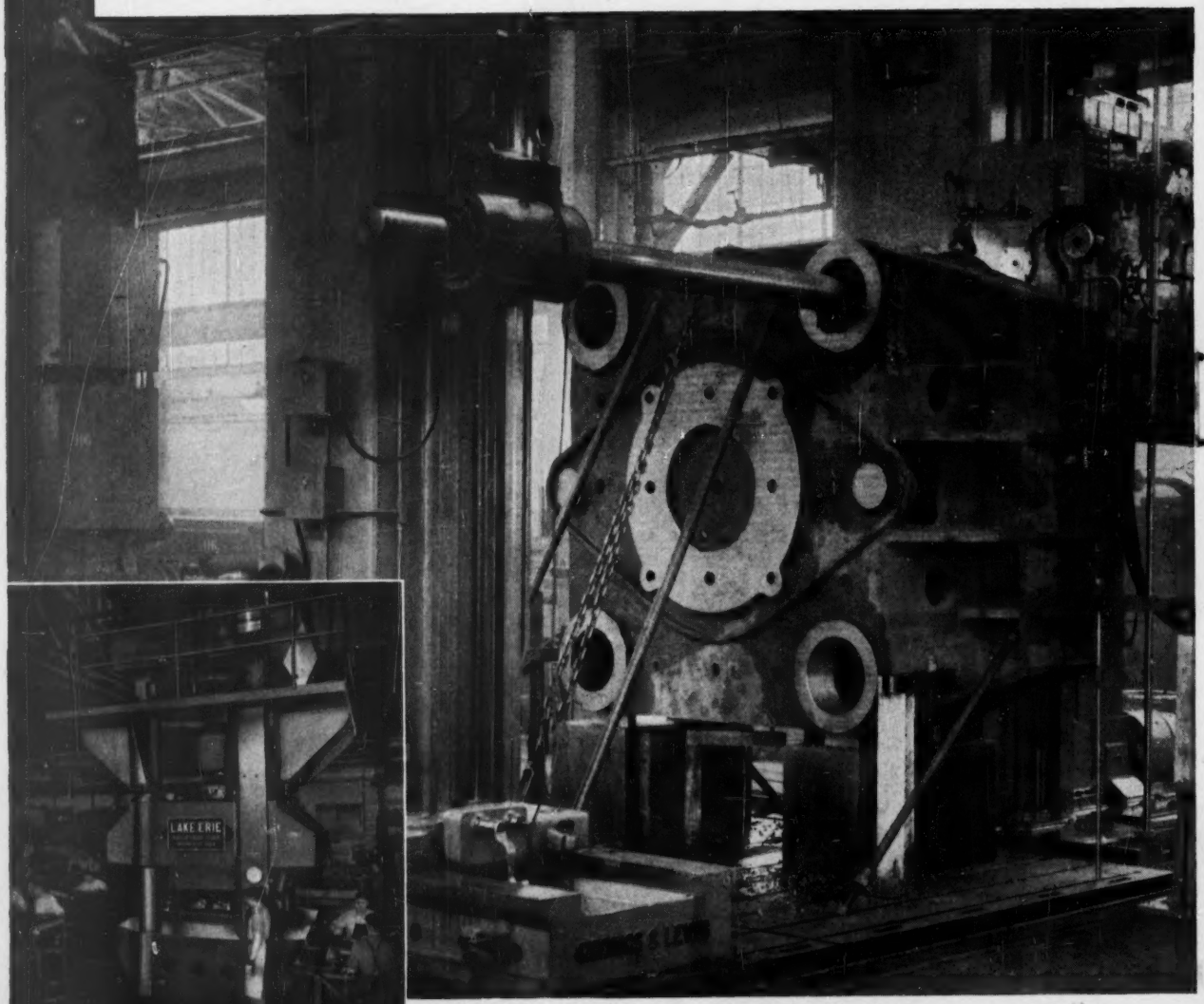
It will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results—greater machine capacity, productivity and better finished products. So, for the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.


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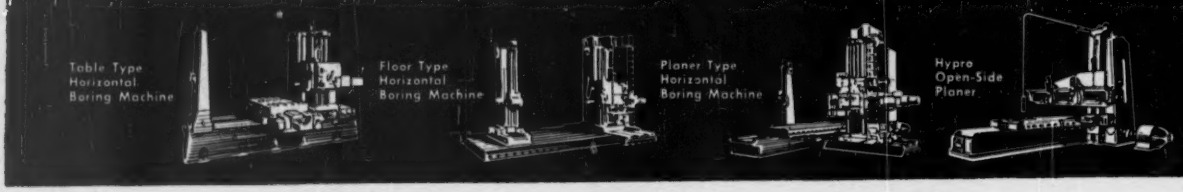
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FOR 52,000 LB. CAST



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GIDDINGS & LEWIS



machining time
STEEL PLATEN



To cut production costs on its diversified line of standard and special hydraulic forming presses for all industries, Lake Erie Engineering Corp. purchased a 570-FUAR G&L Horizontal Boring, Drilling, and Milling Machine.

It's currently being used to machine the 52,200-lb., cast steel moving platen. (Size of workpiece: 144" x 40" x 95½".). Only one setup is needed to line-bore four 15.500" column holes through the platen's top and bottom . . . to back counterbore for 19¾" dia. counterbores . . . to drill, bore, and face two 4 1/16" dia pullback holes. All tolerances are easily held to ± .001". *Setup and machining time on this work is reduced by over 25%* since the G&L 570-FUAR went into operation. This figure is borne out by both time study and resulting incentive standards under which all production work at Lake Erie is performed.

This job is typical of how G&L Horizontal Boring, Drilling and Milling Machines can save your shop time and work handling... free equipment and operators for other jobs. G&L Horizontal's open-type construction means they can take large and small work, simple or complex. Extra-large working ranges mean there's a G&L multi-purpose machine to meet your particular needs. It will pay you to get complete details . . . and information about G&L's Job Analysis Service. There's no obligation. See our nearest representative or write direct. Don't hesitate... delivery might be better than you think.

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

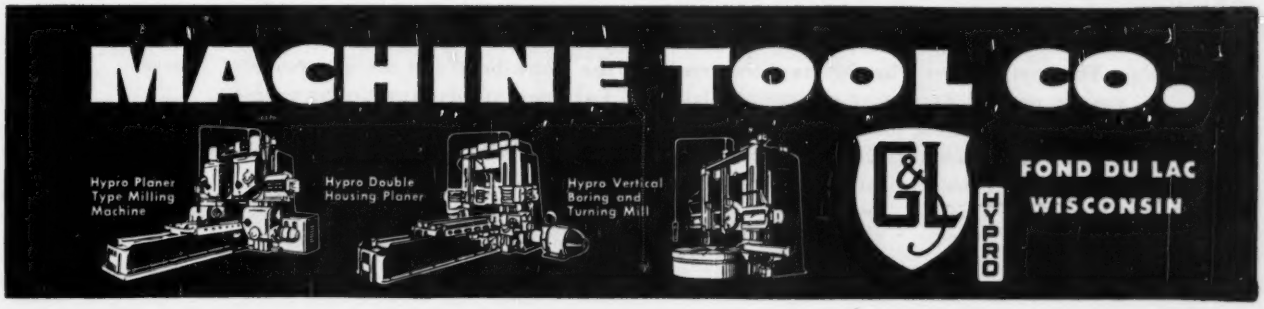
4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.



"It all adds up to this:

MORSE ELECTROLIZED

are the least expensive tools you can buy!"

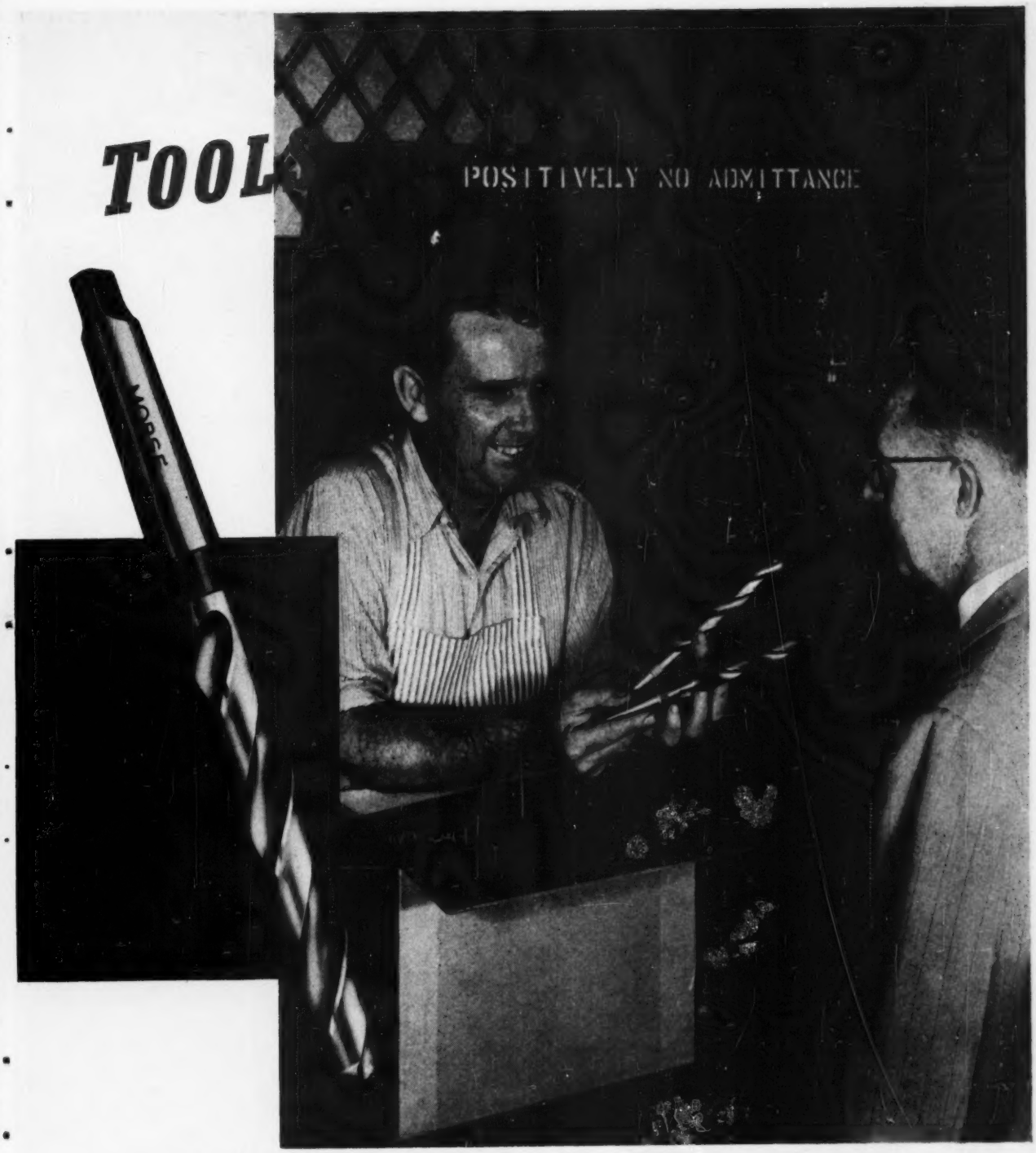


The tool-crib boss never loses a chance to remind the works manager that: "Every new shipment of Morse Cutting Tools that comes into the plant *pays another bonus in plus-production!*"

That's right. For what Morse Tools *really* cut are *costs* . . . by cutting cleaner and faster . . . by staying on the job longer. And then, of course, to go even further and get the unmatched maximum in tool-life, *specify* Morse Electrolized Tools.

Whatever you need, in standard or special-purpose tools contact your Morse-Franchised Distributor. He'll work out the exact specifications that will give you top performance *on your particular job,* at lowest cost. He has the know-how and the assistance of Morse Engineers to solve any tooling problem.

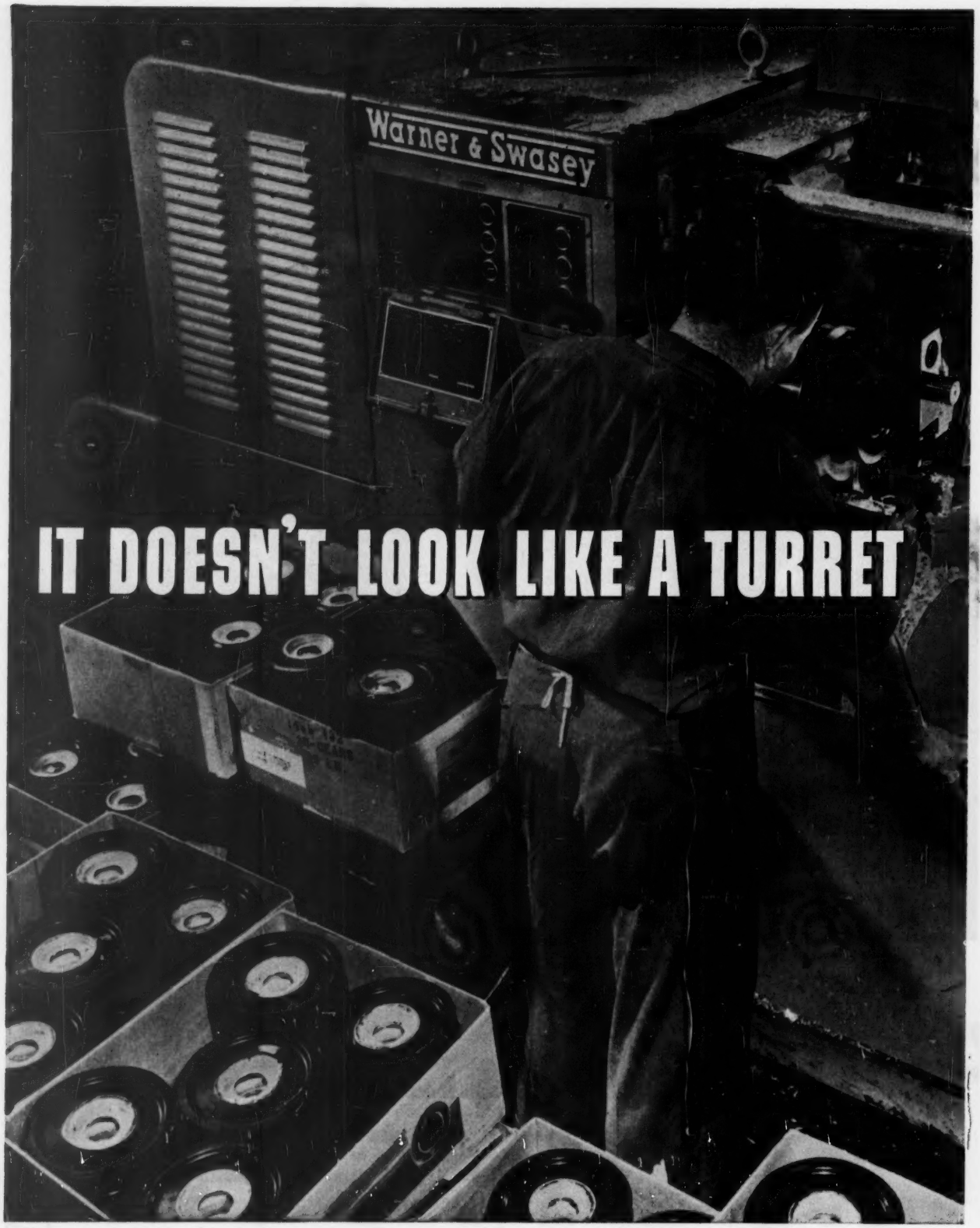
MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



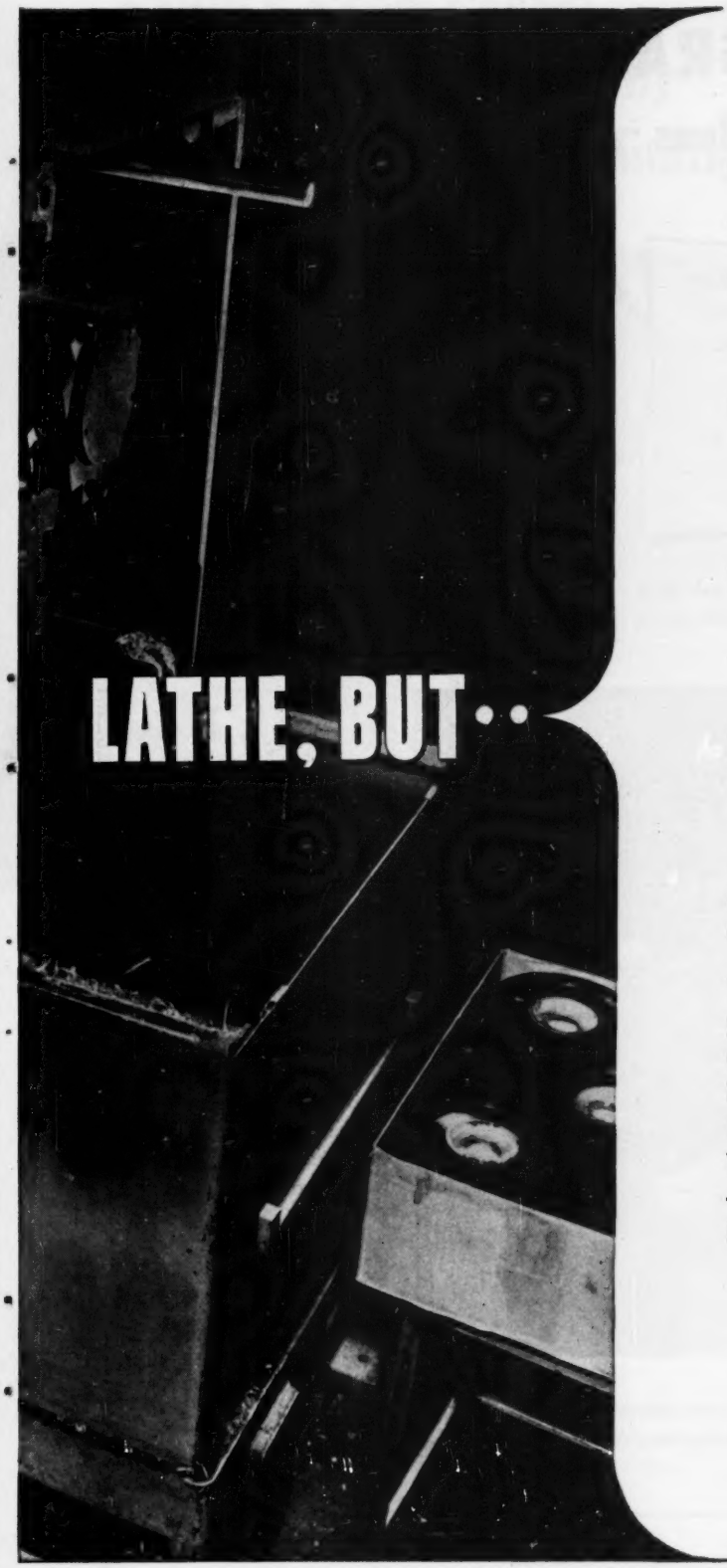
MORSE

Cutting Tools

...buy them by phone from your Morse-Franchised Distributor and save ordering time



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER



LATHE, BUT··

- It sets up *fast*—like a turret lathe.
- It uses turret lathe tools.
- It machines turret lathe lots, on an automatic basis, without the usual penalties of automatic operation.
- It will combine certain operations not possible in accepted turret lathe practice, thus reducing machining time.
- It will automatically change speeds and feeds under cut to assure more efficient performance of your cutting tools.
- It requires less skill to operate —and one man can handle two or more machines.

. . . it is the Warner & Swasey 1-AC Single Spindle Automatic Chucking Machine.

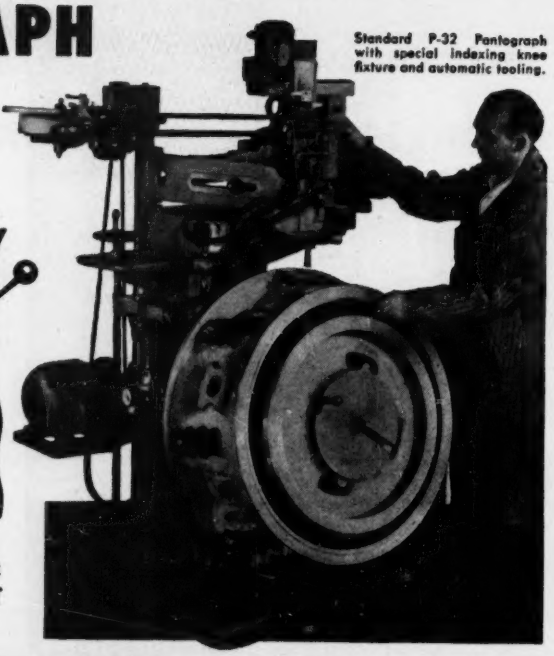
With today's emphasis on greater production, there are undoubtedly certain jobs in your shop that could be machined faster and better on the 1-AC. Call in your nearest Warner & Swasey Field Engineer —he'll show you exactly how it can improve your operation.

WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

GORTON PANTOGRAPH

Solves Complex Profiling Problems with Automatic Cutting Cycle

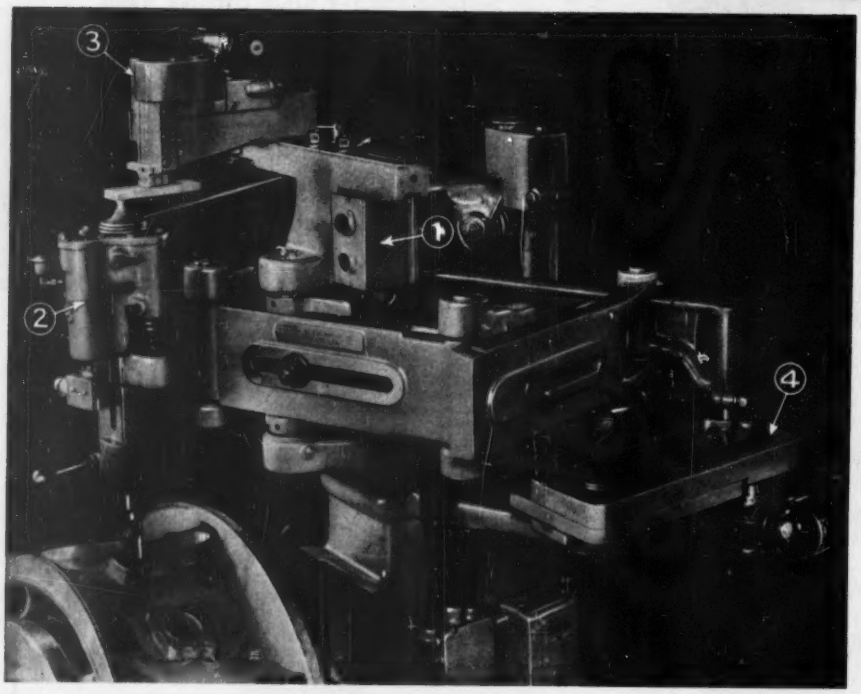


Standard P-32 Pantograph with special indexing knee fixture and automatic tooling.

PROBLEM: Profiling eight ports in outside portion of aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic.

SOLUTION: Gorton P-32 Pantograph profiles all eight ports at the rate of 2.3 minutes per port. Cutting cycle is automatic; indexing is manual.

This is truly a power-driven tracer-control job that would require hours if done by a combination of other methods.



Here's How It Works

❶ Complete cutting cycle begins when "start" button is pressed.

❷ Air cylinder automatically feeds cutter down to cutting position. Cam-operated spindle down feed then takes over. Upon completion of cut and after spindle retracts, this air cylinder further retracts cutter for clearance.

❸ Speed of spindle down feed during cutting is controlled by cam through a Variac.

❹ Motorized chain-driven master starts automatically when "start" button is pressed.

This is just one of many Gorton tracer-controlled production short-cuts which might save you time and money. For complete information, clip and mail the coupon now.

GEORGE GORTON MACHINE CO.
1309 Racine St., Racine, Wis., U. S. A.



Please send at once complete information about the Gorton line contained in Bulletin 1655-1309.

Firm .....

Name .....

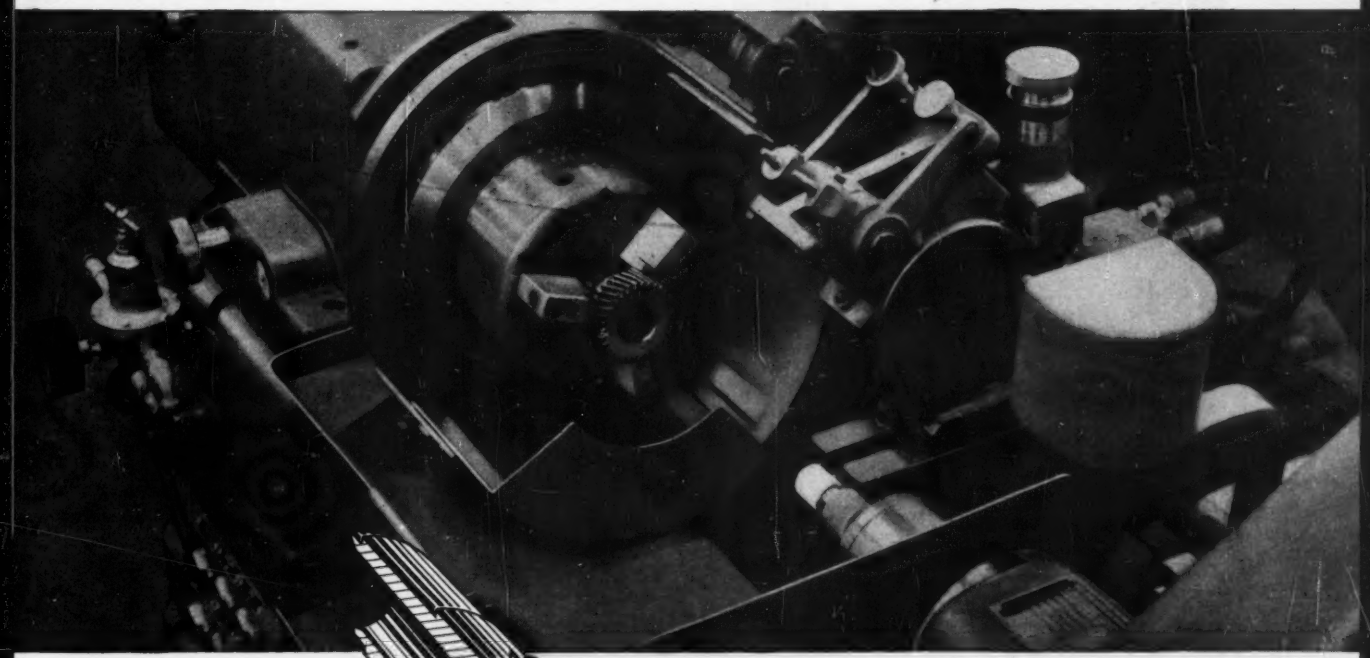
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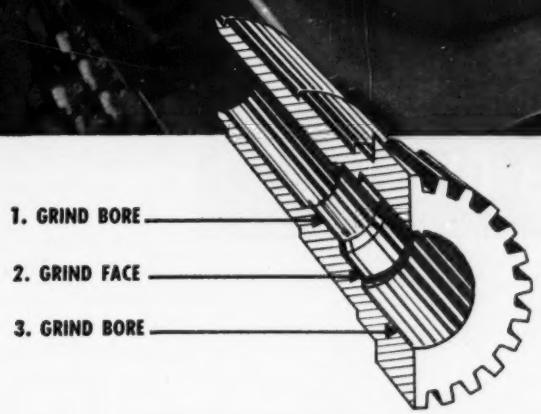
Address .....

City, State .....

Here's How Heald multiplied production by making one head do multiple duty







Double wheel spindle grinds 3 surfaces at the same time

● When one machine can be equipped to perform several different operations at once, there's a big saving in time and effort—and lower cost per part, too. The Heald Model 271 Size-Matic Internal Grinder above shows how this time-saving multiplicity of operations was applied to the finishing of transmission drive sleeves.

The two different size bores and a shoulder are ground simultaneously by a double-wheel spindle, in the following high-speed automatic cycle: The table is run in and positioned by a positive stop, with spindle and wheels in the proper location for grinding. The wheelhead then cross feeds into the work, plunge grinding the bores and bottom face. Cross slide then backs off, wheels are dressed, and table runs back in for short reciprocating finish stroke in the bore.

Remember—when it comes to precision finishing, it pays to come to Heald.

HEALD

Heald machines speed the nation's production

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

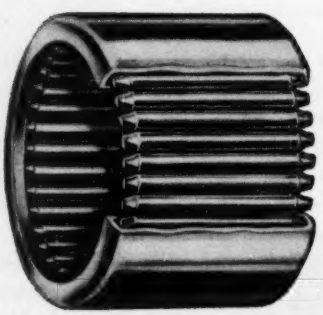


when high speed's a must...

Torrington Needle Bearings are used in many high speed applications and operate smoothly and efficiently at 5,000 . . . 10,000 . . . even 15,000 rpm.

Careful design and precision workmanship give Needle Bearings a low coefficient of friction. And the full complement of small diameter rollers constantly maintains a thin film of lubricant on all bearing contact surfaces. Result: smooth performance, high radial load capacity and long service life at continuous or intermittent high speeds.

So if high speed is a "must" in your product, ask a Torrington engineer to help you get it, along with other Needle Bearing advantages such as compact size, light weight and ease of assembly.



THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

Fast Cutting Gardner Abrasive Disc Saves Valuable Contract



Today, it's the engineering service behind the abrasive disc that counts in cutting costs and increasing output. Gardner Abrasive engineers help you keep costs down by fitting the abrasive to the job. This case history shows how a large company benefited from Gardner service and abrasives.

For help in cutting costs and increasing output of your disc grinders, call the Gardner engineer nearest you. Write for a copy of the Gardner Abrasive Guidebook for better grinding results. It's free.

PROBLEM

To increase disc grinding production in order to meet delivery requirements of an important contract.

JOB DATA:

Grinder: 18" Double Spindle Disc Grinder
Work Piece: Metal Washer 2½" O.D. x ¼" Thick
Material: Steel Stamping, Hardened
Stock Removal: Up to .015" over-all
Tolerances: Within .001" for parallel

GARDNER RECOMMENDATION

(1) Add additional coolant tank to grinder
(2) Suggested using No. 80A60 grain Yellow-Rim Discs with DCS corrugations

RESULT

Output increased 50% over former production due to heavier cuts made possible with this fast, cool-cutting Gardner disc.

GARDNER MACHINE COMPANY
414 Gardner Street, Beloit, Wisconsin

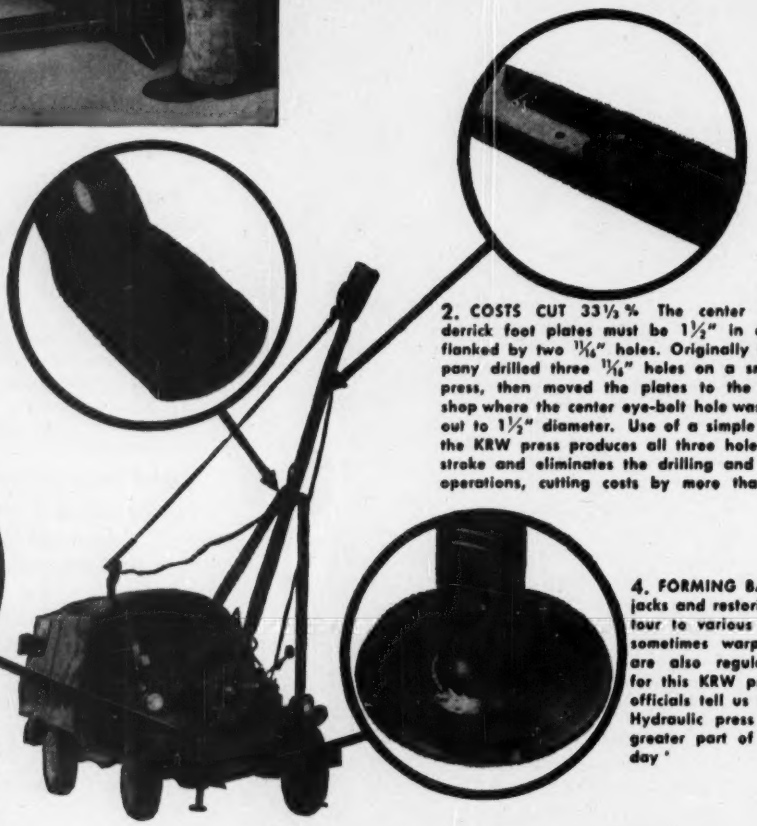
106A

GARDNER
abrasive discs



KRW HYDRAULIC PRESS DOES 4 VITAL JOBS ON POLE-SETTING DERRICKS

BATAVIA METAL CORP. bought a K. R. Wilson 75 ton motor-driven Hydraulic Press two years ago to perform a few routine operations on their pole-setting derricks (derrick shown on telephone truck below). But they soon found that the amazing versatility of the press—the ease and speed with which it can be converted from one set-up to another, makes it a natural for all kinds of trouble shooting. Below are just a few of the jobs their KRW press does.



1. SETTING RIVETS in side legs and front braces of pole-setting derricks. Thanks to their KRW press, Batavia Metal has eliminated loosening of rivets and the resulting loss of valuable production time.

2. COSTS CUT 33⅓% The center hole on derrick foot plates must be 1½" in diameter, flanked by two 11/16" holes. Originally the company drilled three 11/16" holes on a small drill press, then moved the plates to the machine shop where the center eye-bolt hole was reamed out to 1½" diameter. Use of a simple die plus the KRW press produces all three holes in one stroke and eliminates the drilling and reaming operations, cutting costs by more than ⅓.

3. FORMING BRACKET U'S for derrick mountings on front of trucks and riveting the lower sections of front mountings are two more jobs done quickly, accurately and efficiently on the KRW Hydraulic Press.

4. FORMING BASES for rachet jacks and restoring proper contour to various castings which sometimes warp as they cool are also regular assignments for this KRW press. Company officials tell us that their KRW Hydraulic press is in use the greater part of every working day.

Any pressing problems in your plant? Check with K. R. Wilson for the right press to do the job. KRW Hydraulic Presses come in one, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. For facts and prices contact your machinery dealer or write, wire or phone Dep't. 15.

***IMMEDIATE DELIVERY** on type of press shown above up to 75 ton capacity, hand, air or motor driven.*

K. R. WILSON

215 MAIN STREET BUFFALO 3, N. Y.

DESIGNERS AND BUILDERS OF HYDRAULIC PRESSES TO SOLVE ANY METALWORKING PROBLEMS



for Lower Costs!

Take a tip from hundreds of plants all over the country. Stop using old-fashioned cutting fluids. Go Cimcool°, the radically new and different cutting fluid that does a better job and saves you money in three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

For a demonstration in one of your own machines, just write us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

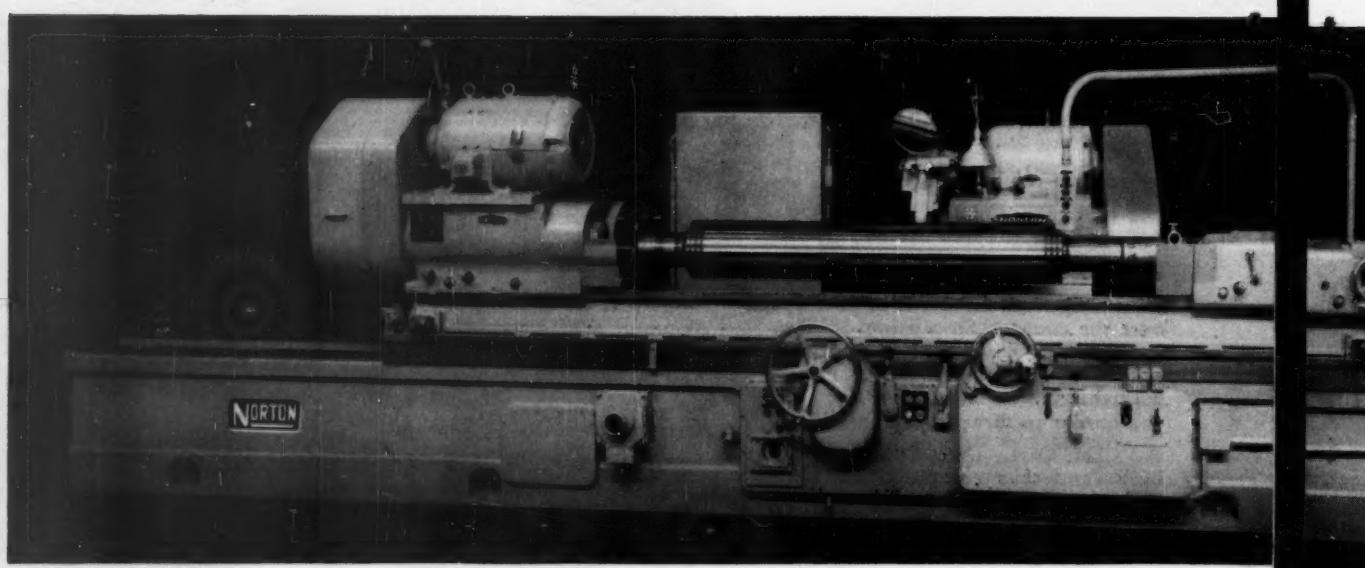
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

New machine speeds cylindrical grinding 4 ways

Faster cutting
Quicker set-up
Easier operation
Less down-time

Norton's new C-2 grinder gets out heavy work



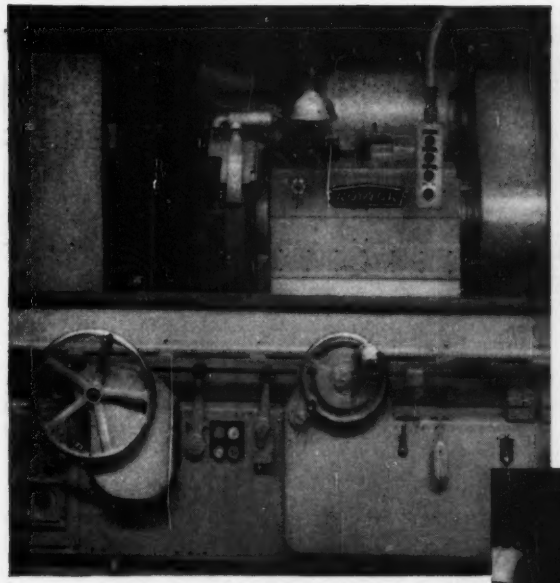
This new grinding machine gets out more heavy production because it works more of the time. When used as a semiautomatic all the operator does is set up the machine and push the button. Machine automatically grinds to size and finish. Operator then unloads. As simple as that!

This is just the kind of grinding machine you expect from Norton — one that's fine from every angle: rate of production, accuracy of work, convenience and ease of operation.

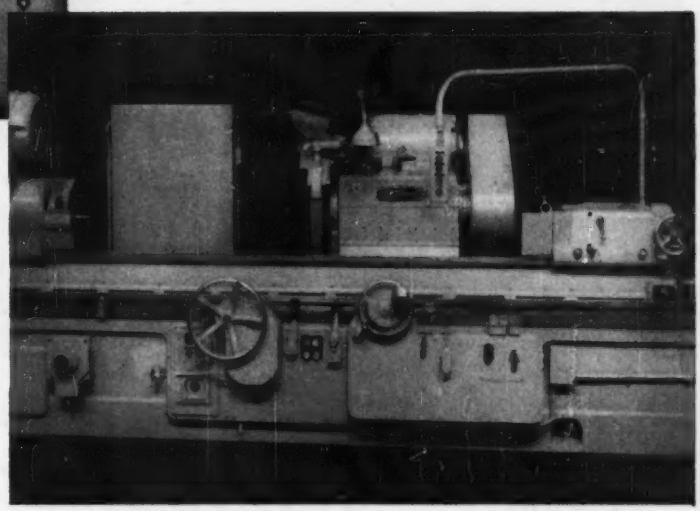
Whether this C-2 machine or another is the type you need, your Norton representative will be glad to talk with you at the planning level. Norton leadership in both grinding wheels and machines is your assurance of satisfactory operation. Only Norton has for a long period of years been making wheels and machines.

Norton welcomes opportunities to help you solve your grinding problems. Our objective is the same as your own — more production at lower costs. For more information see your Norton representative or write us direct.

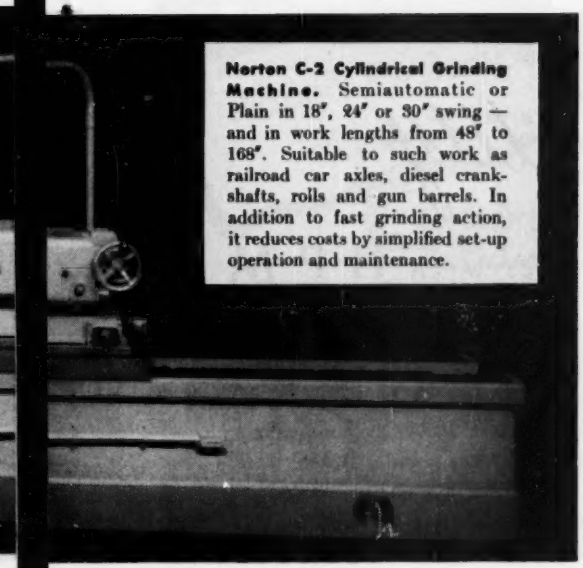
NORTON COMPANY, Machine Division, Worcester 6, Mass.



Easy to operate because all the controls are on the front of the machine. The operator doesn't have to reach for anything! A graduated feed readily indicates the amount of feed. A "click-count" mechanism signals for each .0001" reduction in work diameter. Table truing and grinding speeds may be pre-set and either one obtained by selector lever. Continual resetting is avoided.

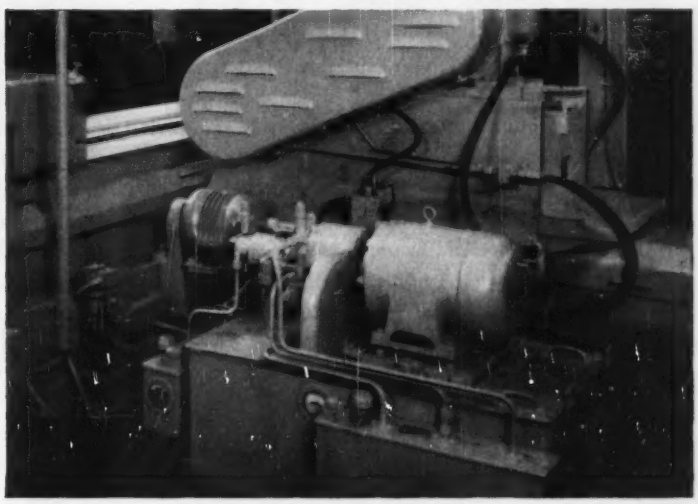


with ease



Norton C-2 Cylindrical Grinding Machine. Semiautomatic or Plain in 18", 24" or 30" swing — and in work lengths from 48" to 168". Suitable to such work as railroad car axles, diesel crankshafts, rolls and gun barrels. In addition to fast grinding action, it reduces costs by simplified set-up operation and maintenance.

Easy to set up, too. Grouping of controls at the front of the machine means minimum time for setting up. Quick change-over from job to job. The wheel feed hand wheel is graduated to indicate amount of feed as the wheel rotates past a fixed pointer.



To Economize, Modernize With **NEW**

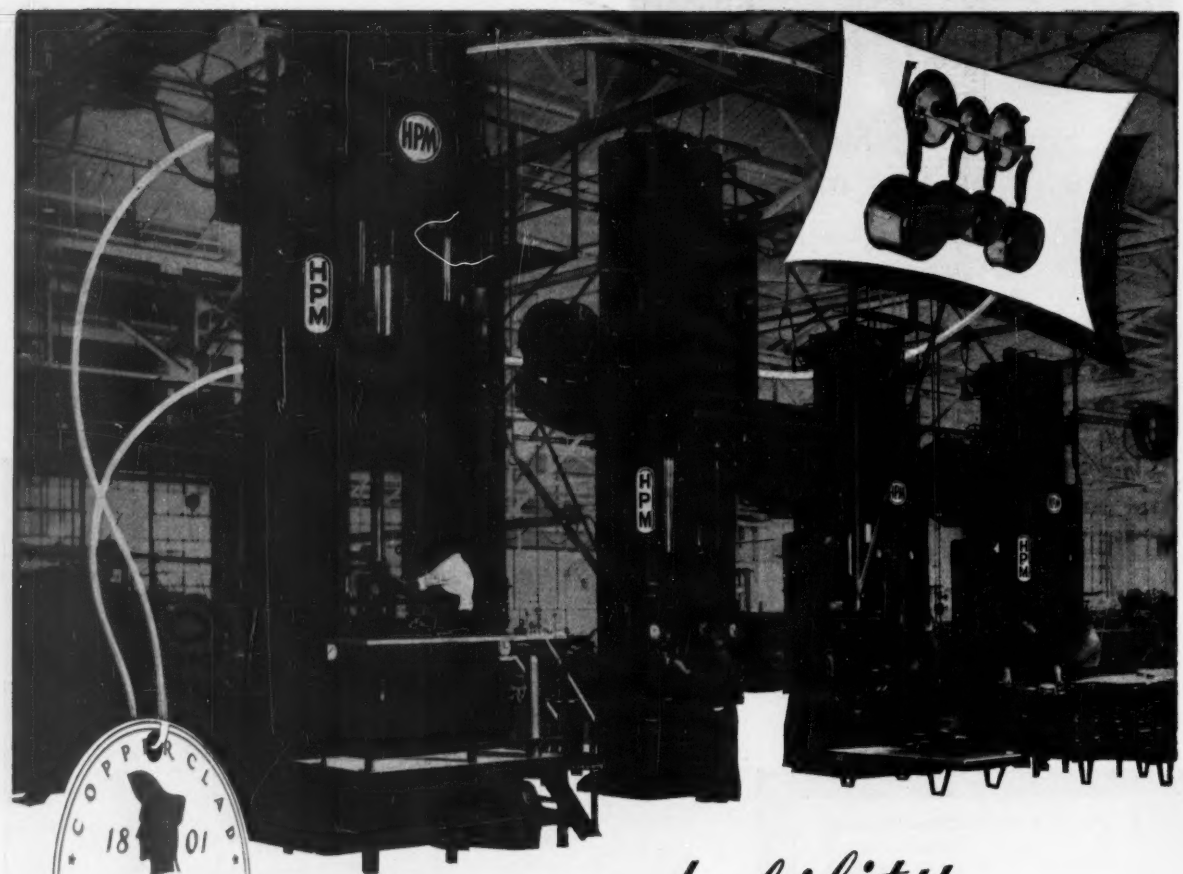
NORTON

GRINDERS and LAPPERS

Making better products
to make other products better

District Sales Offices:
Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

And easy to maintain. All maintenance points are on the outside of the machine. Pumps, motors, filters, lubrication flow control valves, and all reservoirs are readily accessible. Electrical controls are grouped for easy inspection and enclosed for protection.



COPPER CLAD STAINLESS STEEL
18 01
REVERE WARE

Dependability

. . . A PROVEN FACT WITH **H-P-M**

The dependability of H-P-M presses has been proven time and time again! Yes, building presses has been going on at H-P-M for three quarters of a century . . . and dependability is an unwritten part of the specifications you can count on us to continue.

H-P-Ms have contributed to many success stories. An excellent example is the line of H-P-M presses above . . . part of a 10 press operation at Rome Manufacturing Division of Revere Copper & Brass, Rome, New York. This installation is typical of the several H-P-M FASTRAVERSE press operations in other Revere plants. Because of the outstanding, on-the-job performance of H-P-M presses, Revere has installed over 20 H-P-Ms to keep pace with the increasing demand for the popular Revere Ware.

At H-P-M you will find a quality-minded organization, modern factory equipment and the most advanced production techniques. Proven *dependability* is inherent in every H-P-M press . . . it is the result of H-P-M's 75 years of specialized experience in the field of hydraulics. Whatever your production problem, you'll benefit by this experience. Invite us in at the planning stage, won't you?

HPM 75th YEAR
STEERING INDUSTRY THROUGH HYDRAULICS

THE HYDRAULIC PRESS MFG. COMPANY
1042 MARION ROAD
MOUNT GILEAD, OHIO, U.S.A.

Builders of Presses for the Metal Working & Processing Industries • Plastics Molding Presses • Die Casting Machines • Hydraulic Pumps, Valves & Power Units



Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This Veeder-Root Reset Magnetic Counter, specially designed for flush mounting on panels and in instrument-clusters, can be connected in series to any device that has a contact arrangement. And it can be located at central *Count*rol-points, at a distance from the machine or process on which performance-figures are needed. Write for full facts.

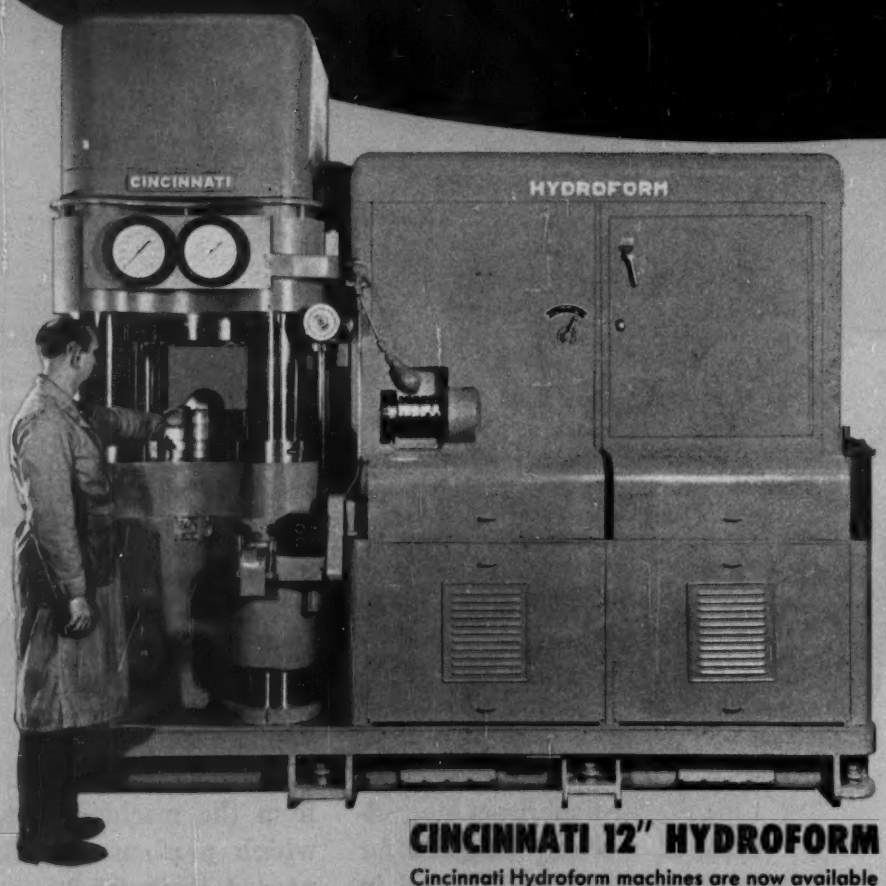
VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONNECTICUT
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"Counts Everything on Earth"

A major advance in metal forming!



NEW CINCINNATI



CINCINNATI 12" HYDROFORM

Cincinnati Hydroform machines are now available in five sizes, capable of handling blanks 12", 19", 23", 26", and 32" in diameter. Maximum depth of draw ranges from 7" on the 12" machine to 12" on the 32" machine. Information on larger machines furnished on request.



NEW HYDROFORM BULLETIN

For a complete description of Hydroforming — tooling details, operation, examples of Hydroformed parts, machine dimensions and specifications —write for your copy of Bulletin M-1759.

Hydroform

CINCINNATI MILLING MACHINE CO

CINCINNATI 9, OHIO

Hydroform

simplifies deep drawing . . . brings to deep drawing many advantages over other metal forming processes!

Hydroforming has revolutionized deep drawing. Practically any shape can be drawn from a wide variety of materials up to ⅜" thick. Most parts can be Hydroformed in a single operation. Tool costs are reduced up to 90%. Part quality is materially improved.

HYDROFORM TOOLING

The Cincinnati Hydroform eliminates the conventional and costly mated punch and die assembly. (See diagram "A".) An oil cavity, sealed by a flexible die member, serves as a universal die and upper blank holder.

Tools consist of a punch of the desired shape, and a draw ring contoured to fit around the punch. Tools are self-centering; self-aligning.

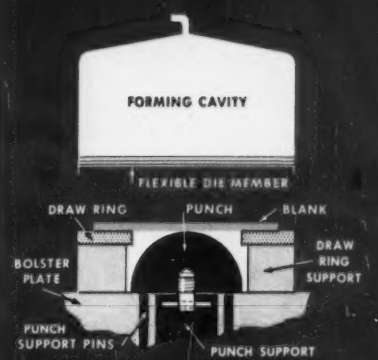
HYDROFORM OPERATION

In Hydroforming the part (see diagram "B"), the blank is placed on the draw ring and the flexible die member is lowered and locked in position. Pressure in the cavity is established at a predetermined setting. The punch is moved upward, forcing the flexible die member and blank to take the shape of the punch. The metal is uniformly shaped with a minimum of stretch or strain in the formed areas. Thin-out and spot stresses are virtually eliminated. Springback is reduced. Surface finish is unimpaired.

One Hydroform user says Hydroforming "represents the most notable advance in metal forming in twenty-five years." And many other manufacturers are now utilizing the far-reaching advantages of Hydroforming —producing such diversified items as

Hollow-ware • Ordnance and Aircraft Parts
Radio, Radar and Television Components
Appliance and Automotive Products • Many Others

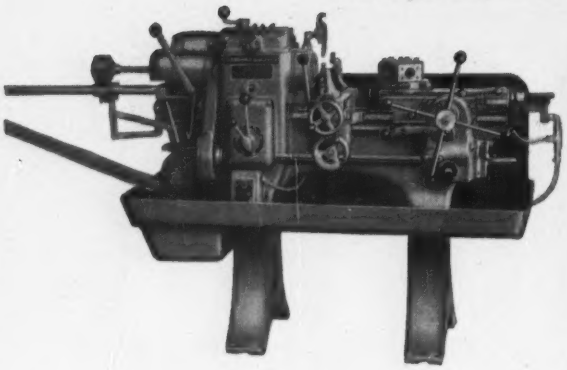
Hydroforming has enabled these manufacturers to produce an improved part—in far fewer operations—at tremendous savings in tooling, labor and material costs. It has changed their thinking on deep drawing and forming. Investigate Hydroforming for your production.





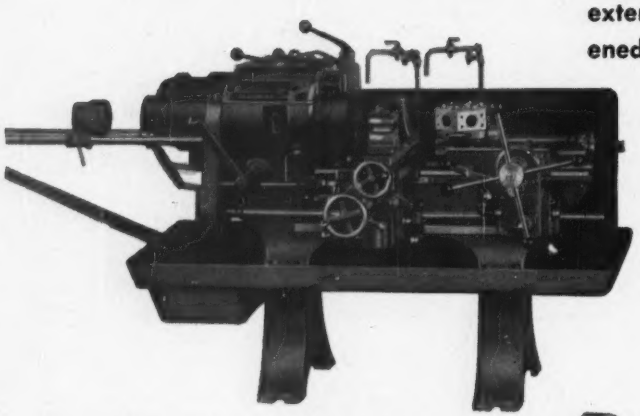
CINCINNATI

No. 2 GEARED ELECTRIC TURRET LATHE
Bar capacities, standard work 1" x 7",
Swing 13½"

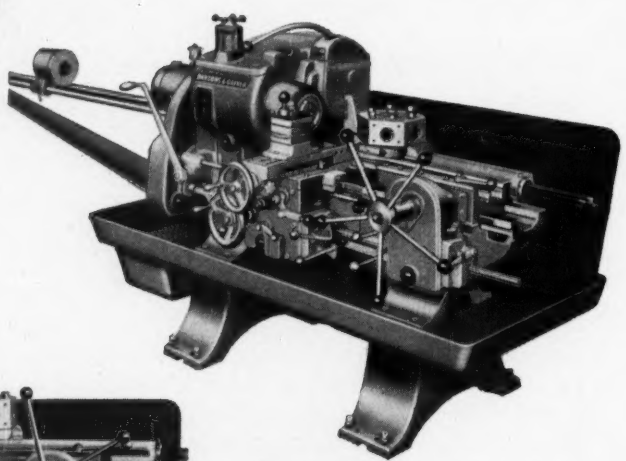


An Outstanding Line of RAM TYPE TURRET LATHES

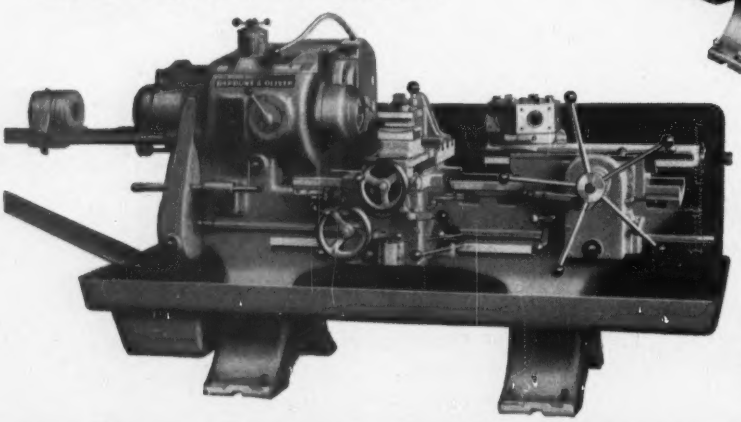
This comprehensive line of Ram Type Turret Lathes features outstanding ease of operation. The most extensive use of anti-friction bearings and hardened-ground alloy steel wearing surfaces combined with highest safety factor in power transmission and utmost rigidity of all tool supporting members lends long lived accuracy and great productive capacity. The exclusively Bardons & Oliver combination of pre-eminent features makes each size a leader in its own field.



No. 3 UNIVERSAL TURRET LATHE
Bar capacities, standard work 1½" x 9",
light work 2" x 9". Swing 15⅜"



No. 7 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2½" x 14",
standard duty work 3" x 14". Swing 21½"



No. 5 UNIVERSAL TURRET LATHE
Bar capacities, heavy duty work 2" x 12",
standard duty work 2½" x 12". Swing 18"

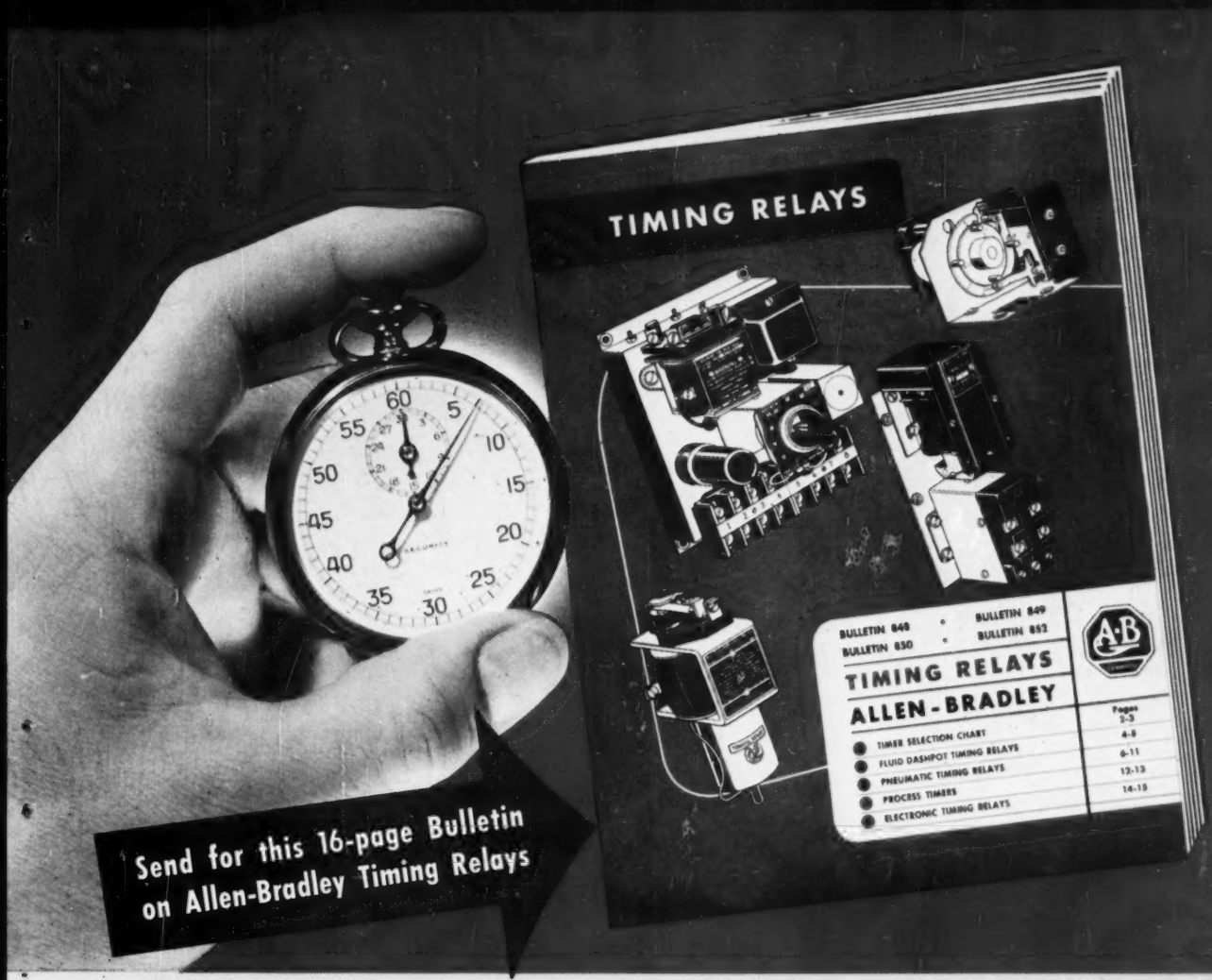
•

WE ALSO BUILD A COMPLETE LINE OF CUTOFF MACHINES

•

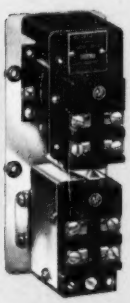
BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO



FOUR POPULAR TIMERS • SIMPLE AND DEPENDABLE

PNEUMATIC



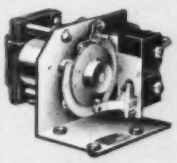
Bulletin 849 pneumatic timing relay is a long life timer of high repetitive accuracy. Has an adjustable pneumatic bellows for regulating the tripping time. Time delay minimum—⅛ second; maximum—3 minutes. The operation of this pneumatic timer is easily changed from "on delay" to "off delay." A reliable, compact timer that is available in a wide variety of contact arrangements. It can be furnished in open type or in enclosures of various constructions.

FLUID DASHPOT



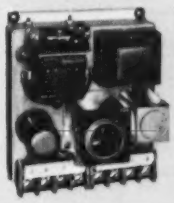
Bulletin 848 fluid dashpot timing relay is a low cost, adjustable timer for applications not requiring a high degree of accuracy, such as for timing electrically operated valves, motor starting sequences, etc. Time delay minimum—2 seconds; maximum—30 seconds. Single pole contacts, either normally open or normally closed. Silicone dashpot fluid assures consistent action at low ambient temperatures. Furnished in open type for panel mounting, or in pressed steel and cast iron enclosures for every service.

MOTOR DRIVEN



Bulletin 850 Style L motor driven timer is a precision switch of the maintained contact type. It alternately opens and closes two switch units 2, 3, 4, or 6 reversals per min. Ideal for controlling reversible machinery such as laundry washers or other processing equipment. Run and drift time easily adjusted. Silver alloy contacts.

ELECTRONIC



Bulletin 852 Electronic Timer has a thyratron tube used as a combination a-c rectifier and electronic switch. In 8 timing ranges from 0.025 sec. to 2 min. Accuracy 2% of setting. Ideal for machine tools, high frequency heating equipment, and photographic printing.

STANDARD ENCLOSURES FOR EVERY SERVICE



NEMA Type 1



NEMA Type 4



NEMA Type 7

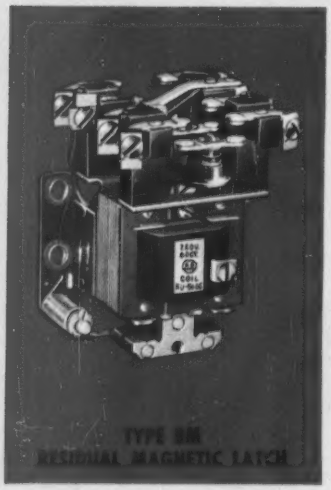
ALLEN-BRADLEY
QUALITY
TIMING RELAYS

A-B Quality

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

6-52—MR

HUM-FREE A-C RELAYS

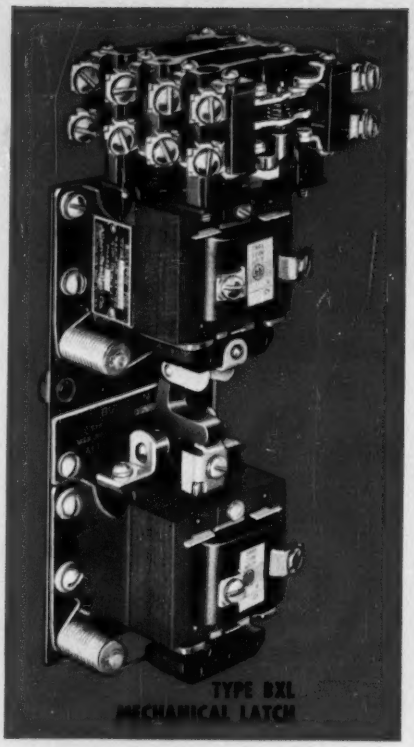


Here are two unique, hum-free relays that require no coil current to keep them closed.

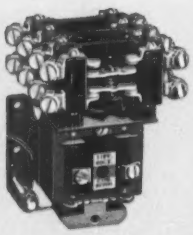
The Type BM relay is a compact unit which is closed by momentarily energizing the solenoid coil. The relay is held firmly closed by residual magnetism until opened by a momentary demagnetizing current.

The Type BXL relay is a standard Bulletin 700 magnetic relay with a mechanical latch. The secondary solenoid, beneath the relay, delatches the upper relay to open it.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

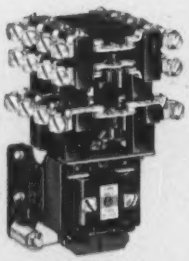


A-C and D-C TROUBLE FREE CONTACTORS and RELAYS
for Automatic and Sequence Controls



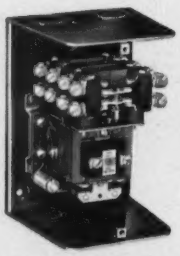
4 Pole A-C Relay

This universal type relay is equipped with four normally open contacts and four normally closed contacts, all actuated by one solenoid plunger. Great flexibility of circuit connections is offered by the double arrangement of contacts. Will handle circuits up to 600 volts a.c. Widely used in refrigeration and air conditioning. Contacts need no maintenance.



8 Pole A-C Relay

Bulletin 700 relays are listed in many contact combinations and polar arrangements. They are widely used for oil burners, stokers, unit heaters, and as control relays for electric furnaces. They are good for millions of trouble free operations. Their consistent performance makes them ideal for machine tool sequence operations. There is no contact maintenance.

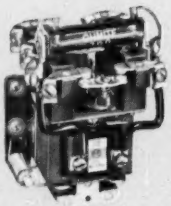


Relay in Enclosure

These relays can be furnished open or in enclosures that protect them in applications where watertight, weatherproof, or explosion-proof enclosures are needed.

Push buttons and limit switches available in a variety of enclosures.

Send for Allen-Bradley Bulletin 700 for details of relays with 1, 2, 3, 4, 5, 6, 8, and 10 poles.



3-Wire Thermostat Relay



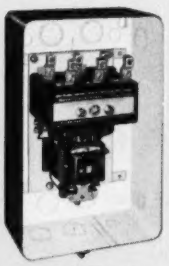
Low Current A-C Relay

For temperature controls with thermostats.



D-C Relay

2 N.C. —1 N.O. contacts.



A-C Contactor

Allen-Bradley a-c contactors are available up to 900 amperes.



D-C Contactor

Allen-Bradley direct current contactors are available in single and double pole construction up to 600 amperes.

ALLEN-BRADLEY

RELAYS & CONTACTORS

6-52—R

Farval helps McKay handle tough plate leveling jobs

FLATTENING heavy steel plates is always a tough job. The rollers that do the leveling and the bearings on which they run are built to take plenty of punishment.

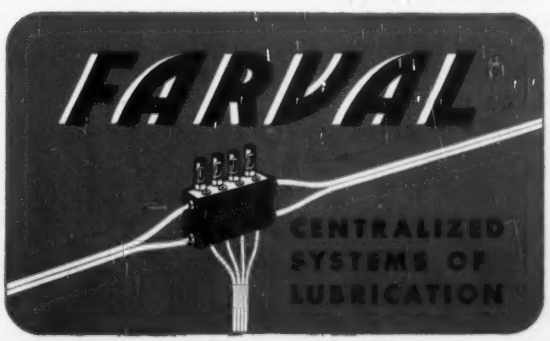
To keep all bearings on its levelers functioning smoothly and efficiently, McKay employs Farval Centralized Lubrication. In fact, Farval has been standard equipment for many years on all the roller levelers and many other types of machines this company manufactures.

Farval assures that every bearing regularly gets the exact, measured amount of lubricant it requires. Special oilers are not needed, lubricant consumption is reduced, bearing life is extended indefinitely and shutdowns for oiling or bearing replacement are eliminated. In short, with Farval on the job, the purchaser of a McKay leveler is insured of getting all the value built into the machine by its manufacturer.

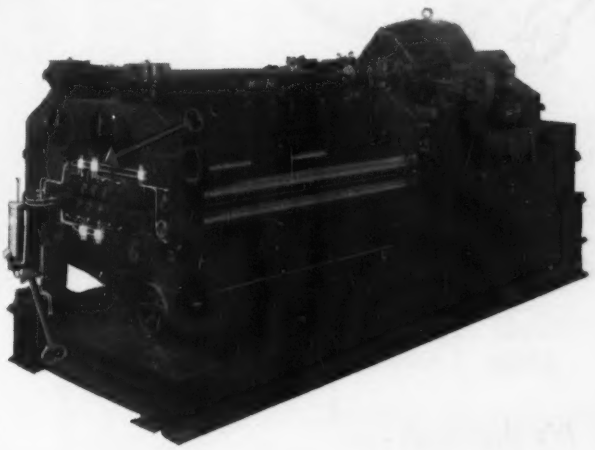
Farval is the original Dualine system of centralized lubrication for industrial equipment, proved practical in 25 years of service. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, the Farval system unfailingly delivers oil or grease to each bearing—as much as you want, exactly measured—as often as desired. Indicators at all bearings show that each valve has functioned.

In or near your city there's a Farval engineer, ready to discuss your lubrication problems and suggest a proper system to meet your particular needs. The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm and Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



FARVAL—*Studies in Centralized Lubrication* No. 129



KEYS TO ADEQUATE LUBRICATION—*Whenever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.*

Photo above by courtesy of The McKay Machine Company.



"Now you can clean hydraulic systems without interrupting production!"

Shell has developed a unique method of cleaning and dehydrating all classes of hydraulic systems. The Shell Cleaning Method does the job quickly and thoroughly . . . without wasting valuable production time. These are the highlights:

It's thorough . . .

This tested method employs a special oil that can do a multiple cleaning job while your machines operate during a regular production shift.

It dehydrates . . . removes sludge . . .

The special cleaning oil will materially dehydrate wet sludges in a system and remove them . . . at the same time it has high solvency for products of oxidation. It coats critical surfaces with an effective rust preventive so that no part of the mechanism is unprotected while the cleaning oil is drained from the unit.

It costs little . . .

The cost of using the Shell Cleaning Method is surprisingly low, since no expensive material nor equipment is required.



". . . and when it's clean . . . fill it with Shell's Improved Tellus Oil"

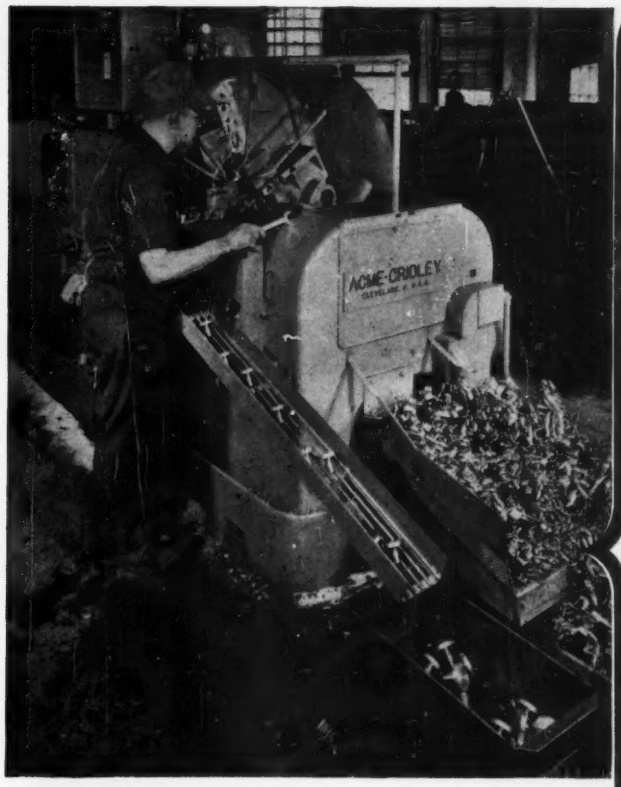
This is the one inhibited oil that:

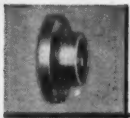
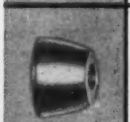
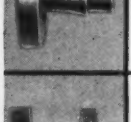
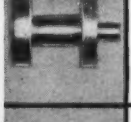
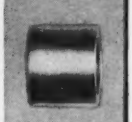
1. **Prevents Rusting . . . with a new combination of rust inhibitors . . . licks the rust problem for good.**
2. **Reduces Foaming . . . even with minor air leaks in the system.**
3. **Excels in Oxidation Stability . . . prevents sludging and emulsion formation.**
4. **Prevents wear . . . maintains tenacious film of great strength at all times.**

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or 100 Bush Street, San Francisco 6, Cal.

SHELL

SHELL HYDRAULIC OILS



	19 1⅛"–2⅜"	14.0 MIN. (Hand Screw Machine)	9.5 MIN.
	32 1"–2⅜"	5.0 MIN. (Old Style S. S. Automatic)	3.7 MIN.
	12 2½" DIA.	15.0 MIN. (Hand Screw Machine)	5.4 MIN.
	5 2½" LONG	20.2 MIN. (Hand Screw Machine)	12.0 MIN.
	16 1¾₆"–2¾₆"	11.0 MIN. (Hand Screw Machine)	7.0 MIN.
	10 2" DIA.	7.5 MIN. (Hand Screw Machine)	3.2 MIN.
	16 4¼" LONG	27.0 MIN. (Hand Screw Machine)	12.5 MIN.

500 PIECES
IN THE BIN...FOR THE
COST OF 100!

The Acme-Gridley Model M Single Spindle Automatic Bar Machine cuts costs on small-lot work—and speeds production, too.

That's the customer-documented experience of The Elliott Company, in their Springfield, Ohio plant. The figures in the table above are their own—as is the statement of cost saving. They further state that these savings will recover cost of the machine in three years.

Notice the wide variety of parts, and the uniformly faster machining times on each—an average production increase of 87%. But faster production and versatility are only part of the story. Additional savings—in machine and tool investment, in floor space, in man hours—go to make up the five-to-one reduction in production costs realized by The Elliott Co.

All of these are the direct results of inherent design features of the Model M: wide, open tooling zones, for easy access; heavy, rigid frame construction, to permit the use of carbide tools; simple camming, for quick change-over; three automatic spindle speed ranges, for most efficient cutting; independent camming for the eight tool slides, to permit combining cuts—these and many more.

Learn about them in Bulletin M-50, your guide to lower machining costs on small-lot work.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

General Purpose





Only CARBO

TRADE

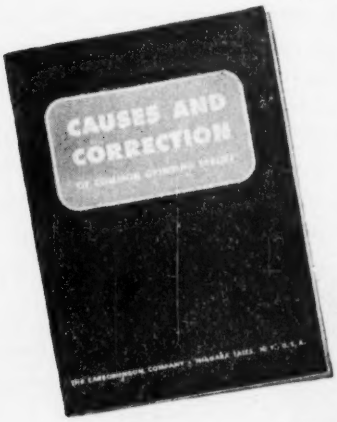
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Wheels . . .



General Purpose Wheels by CARBORUNDUM give you the widest possible range of abrasive tool versatility. Furnished in standard sizes for every known make of grinding machine, they improve the quality and quantity of work from veteran and inexperienced operators alike. In the cool cutting, long lasting V30 bond developed especially for general purpose work, "ALOXITE" aluminum oxide wheels are outstanding performers. They give you the ideal combination of abrasive grain, bond, grade and structure which provide highest grinding performance at lowest total cost.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!



This "tell-all" booklet is FREE!

THE CARBORUNDUM COMPANY, Dept. M 81-81
Niagara Falls, New York

Please send me, FREE, your booklet, "Causes and Correction of Common Grinding Errors."

NAME AND TITLE

COMPANY

STREET AND NUMBER

CITY ZONE STATE

RUNDUM

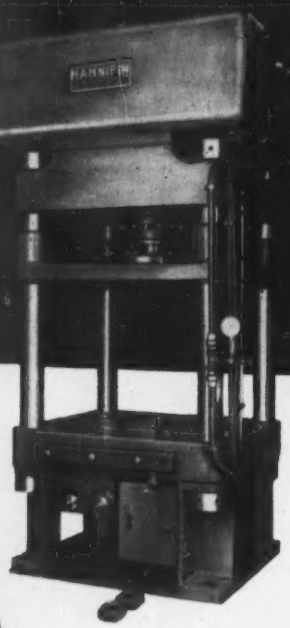
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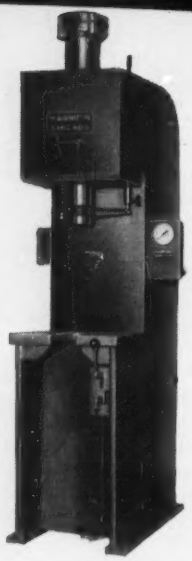
offers ALL abrasive products...to give you the proper ONE

81-81

FROM ½ TON TO 150 TONS...

You name the job We have the Press!





150-Ton Four-Column Press—a standard Hannifin design with semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. Dual electric push button control.

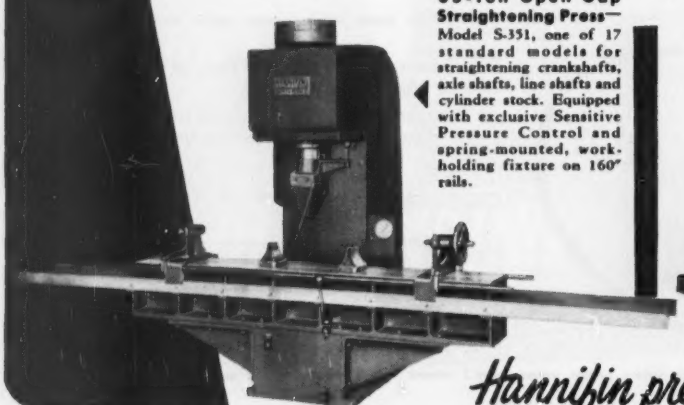
15-Ton Forcing Press—with built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. Gap, 22"; stroke, 21"; reach, 10"; table, 19" x 22" with U slot.

Molding, straightening, forming . . . assembling, riveting, punching, staking, marking . . . there is a broad variety of vitally important production functions best handled by one of the many Hannifin standard presses. For each has the easy, sensitive and safe control, the dependable, efficient operation and the rugged strength that mark it as a leader.

The Hannifin line includes more than 75 standard models of fast, self-contained presses. It's easy to find one that fits your requirements. Special adaptations in stroke, gap, clearance or controls are easily made in most models.

To find out what Hannifin Hydraulic Presses we have for you, fill in and mail the coupon. It will bring specific information . . . promptly!

35-Ton Open Gap Straightening Press—Model S-351, one of 17 standard models for straightening crankshafts, axle shafts, line shafts and cylinder stock. Equipped with exclusive Sensitive Pressure Control and spring-mounted, work-holding fixture on 160" rails.





½-Ton and 1-Ton Air-Operated Han-D-Press—designed to meet high production schedules on assembling, staking, riveting, punching, marking and pressing. Electric control for hand or foot operation.

Hannifin presses make it Easy



Hannifin Representatives Are at Your Service in These Leading Industrial Centers

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Hydraulic Presses • Pneumatic Presses • Hydraulic Riveters
Hydraulic Cylinders • Air Cylinders • Air Control Valves

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1100 S. Kilbourn Ave., Chicago 24 Illinois
Please send me Bulletin 130 on Hannifin Hydraulic Presses.

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Title.....

Company.....

Address.....

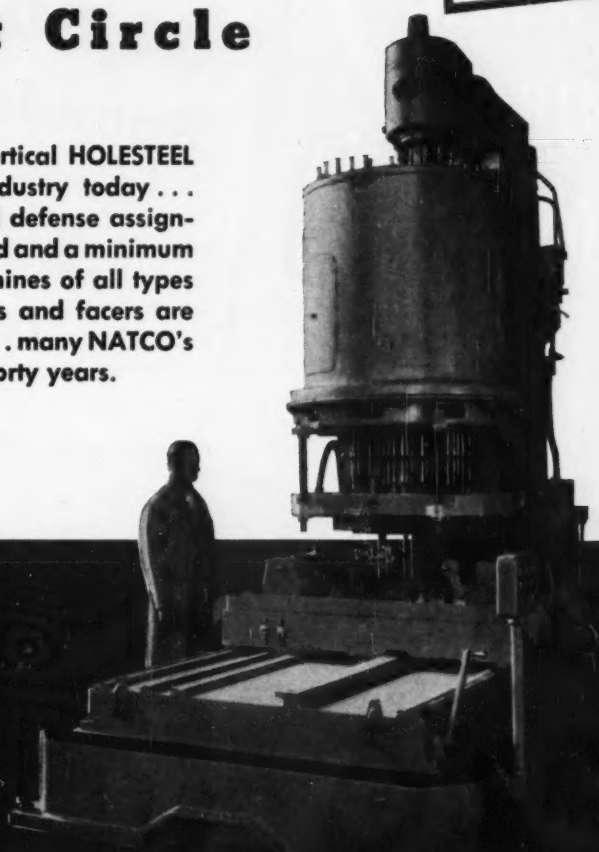
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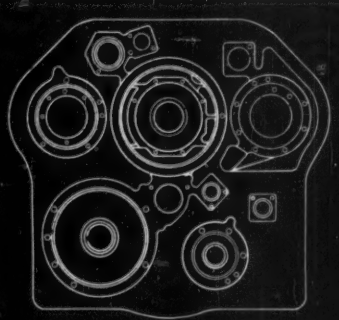
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Drilling 50 Holes on 36″ Bolt Circle

Natco Engineered for Quality Production

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36,000,000 Pounds of Steel

* * *

1,296,000 Dollars

with TOCCO* Induction Heating

● In 1944 the Army Chemical Corps called for 24 million bomb noses of a certain type. Current techniques required 84 million pounds of steel and more automatic screw machines than could possibly be made available.

● Edgewood Arsenal, given the task of solving this vital production puzzle, abandoned conventional machining methods and employed a hot extrusion process—using TOCCO Induction Heating to bring 2 pound steel blanks to forging heat. *Former methods required 3½ pound blanks to produce the same bomb noses.*



60 KW, 10,000 cycle TOCCO machine heating steel blanks for extrusion into bomb noses.

● In addition to vast savings in steel and money, the new shells had superior fragmentation properties. But above all the 1944 schedule was met *—enough and on time* to strike a telling blow for victory in World War II.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO



TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Induction Heating Equipment must meet the requirements of the Federal Communication Commission's Rules and Regulations Relating to Industrial, Scientific and Medical Services, Part 18. All TOCCO equipment is certified to comply with these rules and regulations.


WHEN THE
GOING IS
TOUGH...
CLE-FORGE
HIGH SPEED DRILLS
will give you
more holes per grind...
Telephone Your Industrial Supply Distributor
CLEVELAND
DISTRIBUTORS EVERYWHERE
are ready to serve you!
THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
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E. P. Barrus, Ltd., London W. 3, England





"We started to make money when we installed our first Moore Jig Borer in 1936"

SAYS AL STAUBER, MANAGING PARTNER, DACO MACHINE & TOOL COMPANY



Some were pretty small: All were very accurate...Die and Stripper for piercing 47 holes in stainless steel shutter stamping were jig bored and jig ground by Daco on Moore equipment. Hole location was within ±0.0002; hole sizes were held within ±0.0001.

Now Daco, one of nation's best-equipped tool and die shops, has 5 Moore Jig Borers and 3 Moore Jig Grinders

The toolroom which has at its disposal modern methods for fast and accurate hole location will take complex work in stride—*and make money*. Al Stauber proved that when he installed, in 1936, his first Moore Jig Borer at Daco Machine & Tool Company, Brooklyn.

Soon a jig grinder took its place alongside. Daco then had the perfect hole location partnership—the jig borer to locate and bore the hole accurately... and the jig grinder to relocate and grind it after hardening (and also grind contours).

Now famous for instruments and instrument tooling, Daco uses 5 Moore Jig Borers and 3 Moore Jig Grinders for 90% of its hole locating and a good percentage of its contour grinding operations. All have been operated at least 50 hours weekly the last four years; several, through two shifts. Daco also has two Moore Panto-Crush Wheel Dressers and a Moore Die Flipper.

You can prepare for tomorrow's competition *by writing today* for literature describing Moore Jig Borers and Jig Grinders.

Moore Special Tool Company, Inc., 734 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

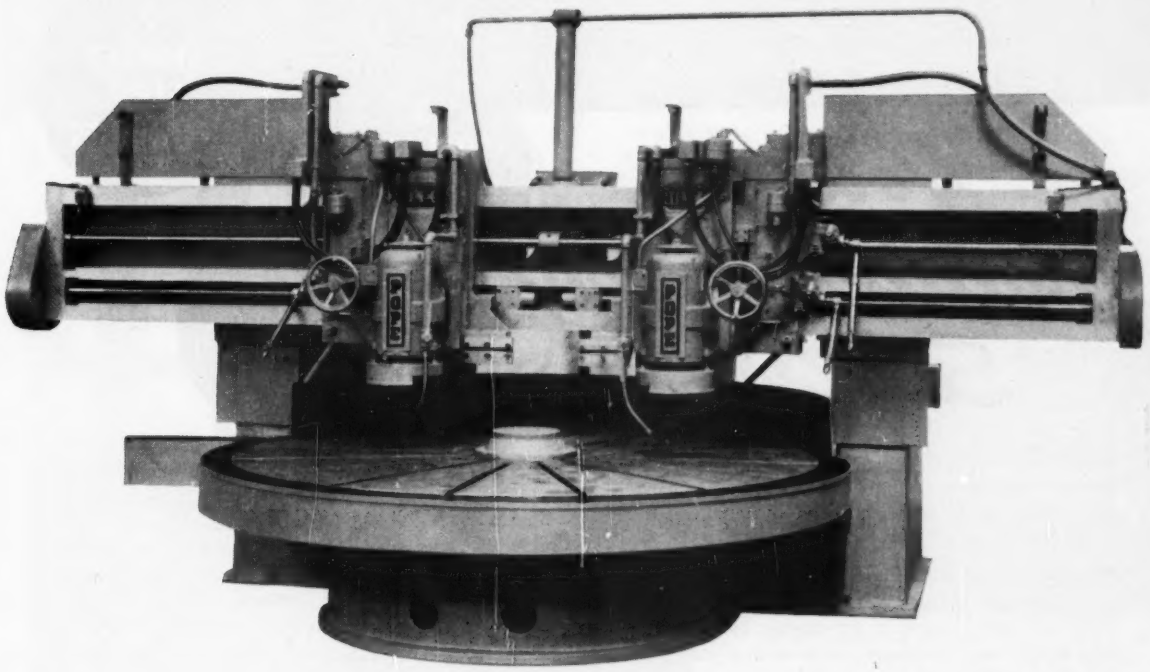
Specify POPE

2500 SERIES—HEAVY DUTY MOTORIZED SPINDLES

for YOUR BORING MILLS PLANERS SURFACE GRINDERS AND OTHER MACHINE TOOLS

NILES TOOL WORKS
BALDWIN—LIMA—HAMILTON CORP.

SELECTED POPE 2500 SERIES SPINDLES for several of their high production machines such as the 120" Niles Boring Mill Type Grinder shown below.



For continuous production of accurate parts and for trouble-free operation, install

POPE PRECISION SPINDLES

No. 86

POPE

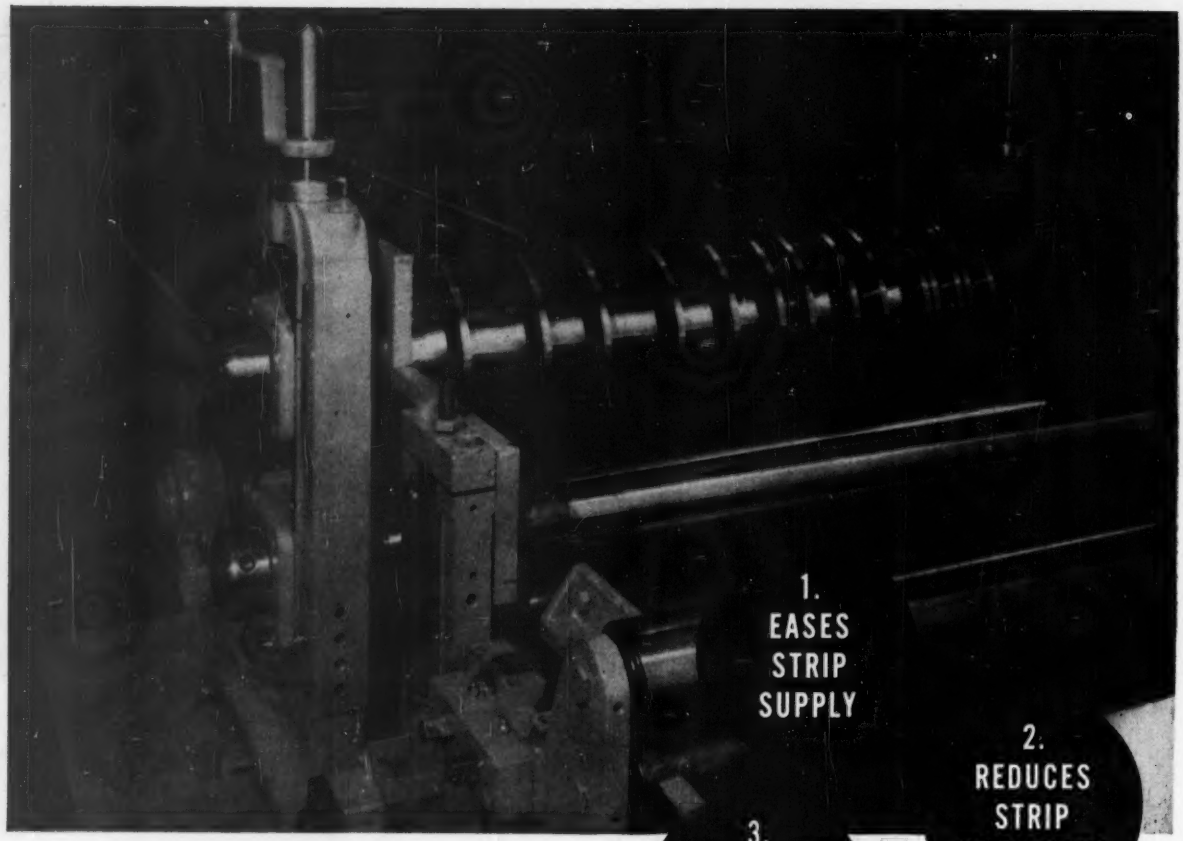
TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES



Yoder Multiple Rotary Slitters

• The advantages of doing your own slitting far exceed the mere saving in cost per ton of strip, even though this saving may be sufficient to repay your investment in less than a year.

Most fabricators after installing a Yoder slitter agree that one single advantage, viz., the ability to use mill-width coil stock instead of slit strands, by multiplying their sources of strip supply, has more than justified the cost of the slitter.

The Yoder line of slitters, uncoilers, recoilers, scrap choppers and other slitting line equipment, is the most complete and highly standardized. There are more Yoder slitters sold than of any other make. Yoder engineers are anxious to assist you in determining the size and kind of slitting equipment which will best serve your needs, at the lowest cost. Yoder Slitter Book deals broadly with both the economics and mechanics of slitter operation. It is yours for the asking.

THE YODER COMPANY • 5504 Walworth Avenue, Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS–cold forming and welding

ENGINEERING YODER MANUFACTURING

How's this

for putting brains to work?

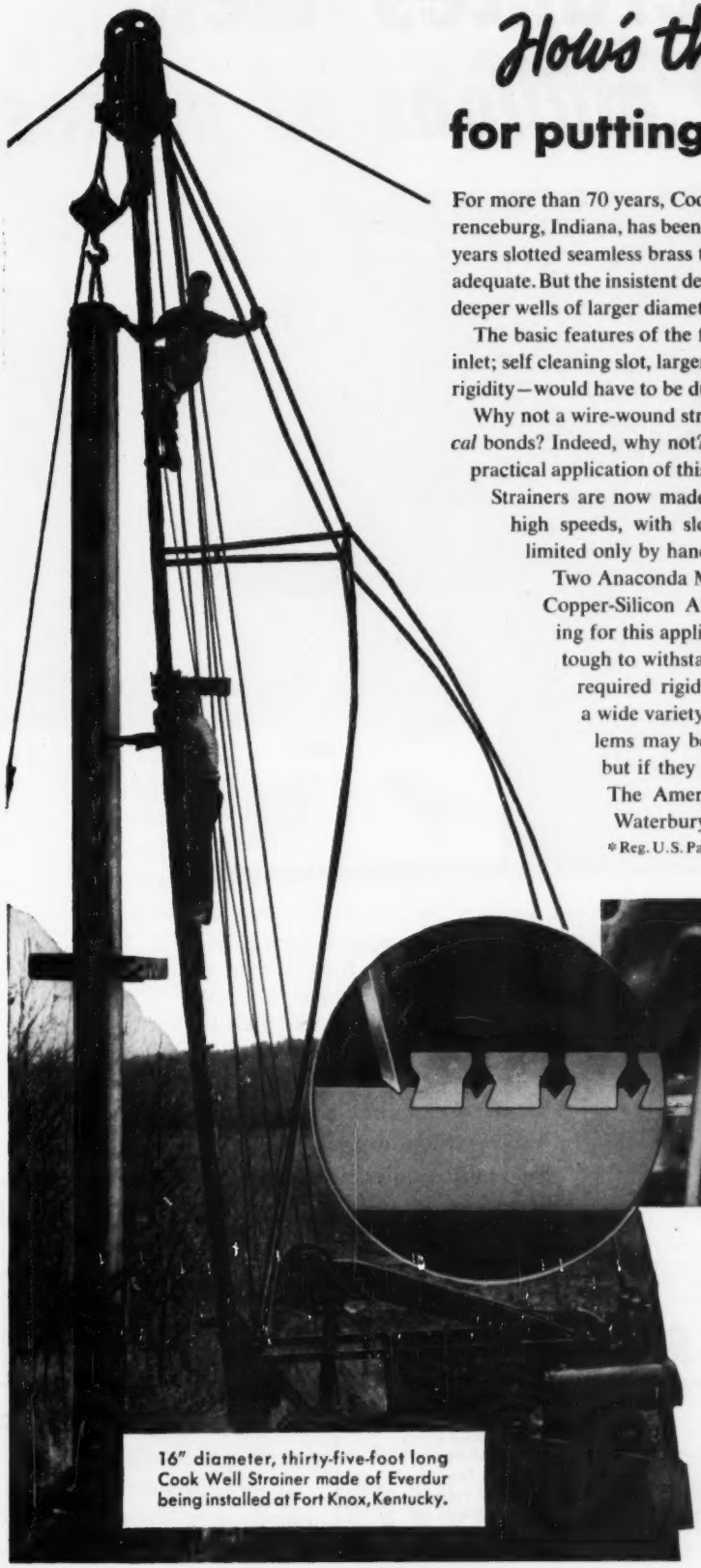
For more than 70 years, Cook Well Strainer Company, Inc., of Lawrenceburg, Indiana, has been making well strainers. For many of these years slotted seamless brass tubes, up to 12″ diameter, proved wholly adequate. But the insistent demand for more and more water called for deeper wells of larger diameter—and strainers to meet the new needs.

The basic features of the famously successful tube strainer—direct inlet; self cleaning slot, larger inside than outside; one metal; strength; rigidity—would have to be duplicated in larger diameters.

Why not a wire-wound strainer with automatically-made *mechanical* bonds? Indeed, why not? The illustrations on this page show the practical application of this ingenious idea. Cook Wire-Wound Well Strainers are now made in sizes up to 40″ inside diameter—at high speeds, with slot widths readily variable, and lengths limited only by handling facilities.

Two Anaconda Metals, Red Brass-24 and Everdur*-1010 Copper-Silicon Alloy, have proved themselves outstanding for this application. Both machine readily, are plenty tough to withstand upsetting, contribute strength for the required rigidity, and provide excellent resistance to a wide variety of corrosive ground waters. Your problems may be different, mechanically or chemically, but if they involve copper, brass or bronze, call on The American Brass Company, General Offices, Waterbury 20, Connecticut. 5293

*Reg. U.S. Pat. Off.



16″ diameter, thirty-five-foot long Cook Well Strainer made of Everdur being installed at Fort Knox, Kentucky.



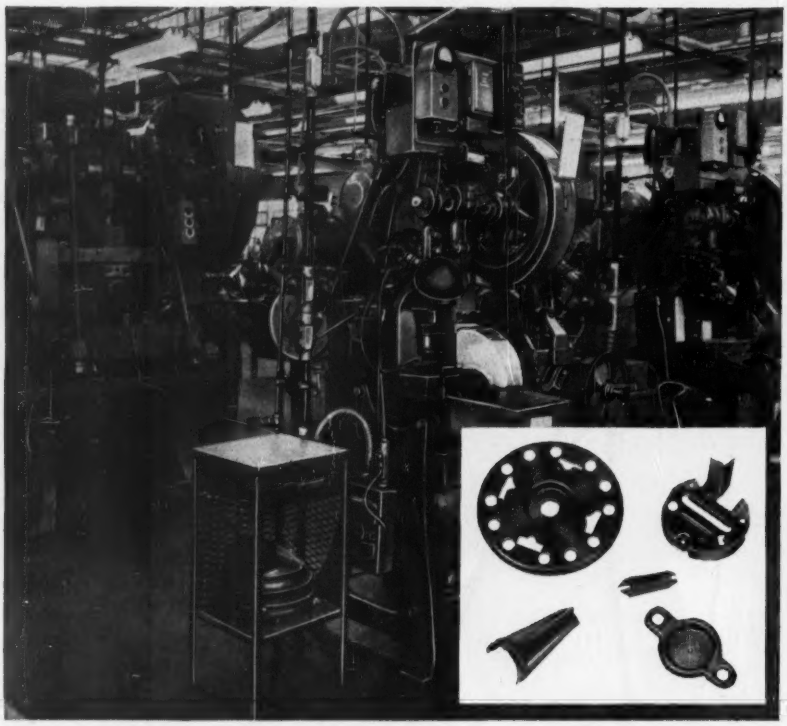
As the supporting skeleton of bars revolves in this winding machine, each bar is machine-notched ahead of the spirally wound wire (see circle illustration). This wire is a special drawn Anaconda Shape of modified keystone cross-section. A circular form tool then displaces the metal on one side of the V-groove into the dovetail section of the wire, locking it securely.

the name to remember

ANACONDA

COPPER, BRASS & BRONZE

Close Tolerances Held
on runs of millions of pieces



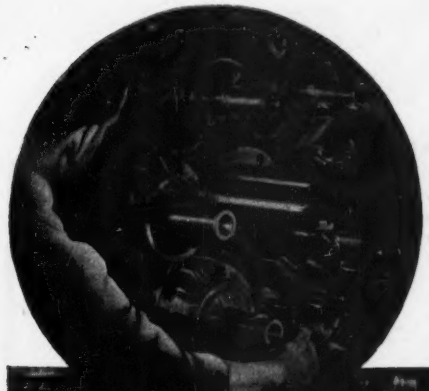
V & O Presses at Sylvania Electric Products, Inc., are used to fabricate small, light parts for radio tube manufacture and heavier parts in television picture tubes, radio and television sets and various other components. Runs on some of these parts are as high as 10,000,000 pieces. Extremely close tolerances are being held for certain parts over these large quantities. "Without a press that could be relied upon," reports Sylvania, "such figures as those noted could not be continued day by day, and year by year."

Only the best is good enough

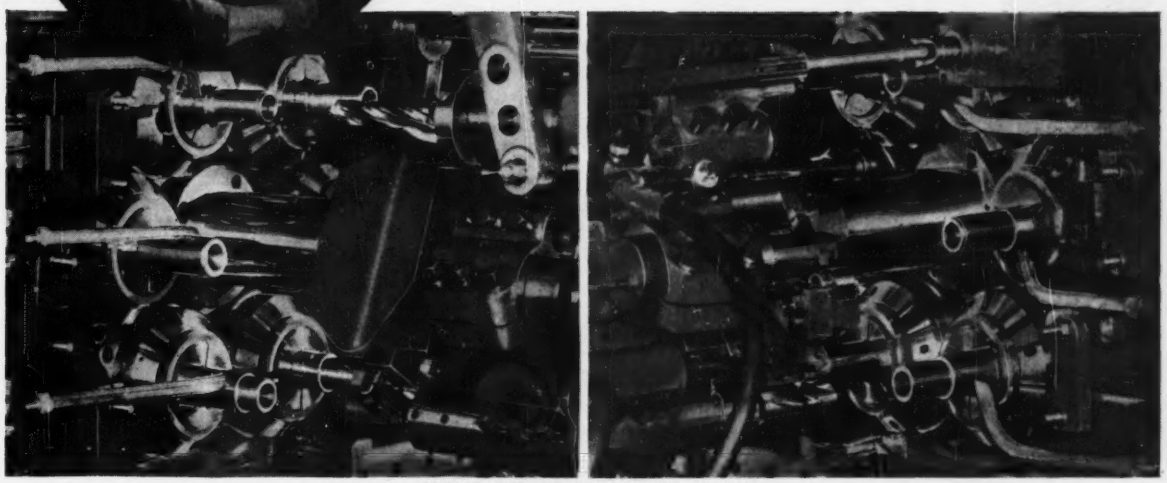


DESCRIPTIVE CATALOGS Catalogs containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 341 Union Turnpike, Hudson, N. Y.

THE V & O PRESS COMPANY
Division of Emhart Mfg. Co.
BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889
HUDSON **NEW YORK**



NO NEED TO "SETTLE" FOR LESS



FRONT AND REAR SIDES OF 2⅝-SIX

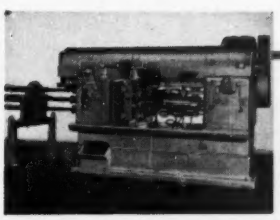
Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.



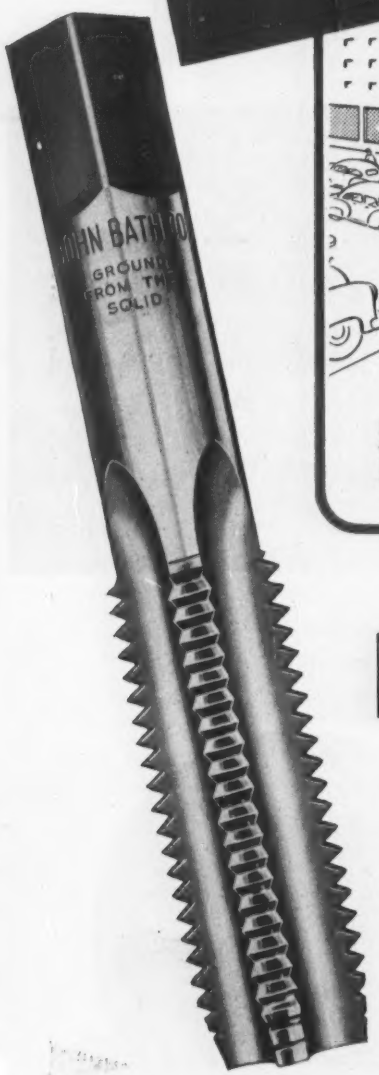
In producing the piece shown, on a 2⅝-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.

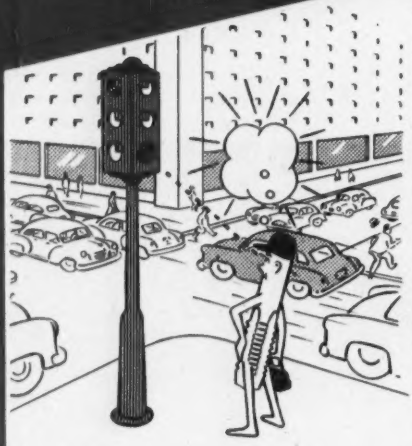


A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

TAP-ODDITIES





Pete says — "a traffic signal
Gives everyone a break.
Each morning when I "gotta-go" —
What a difference it would make!"



Now, bathroom rush-hour traffic,
On schedule must behave.
Pete's daughter gets 3 minutes
And Pete . . . a chance to shave!

Stay out of production "tie-ups" . . . keep your schedules "on the go" with BATH ground from the solid TAPS!

Of this you can be SURE . . . Bath Ground Thread Taps are made to give longer tap life — are accurately ground for high speed thread cutting efficiency and uniform performance.

Modern equipment is used for heat treating . . . for flute milling and grinding . . . for all steps of manufacture — to final 100% inspection. This constant check assures maintenance of BATH quality-control standards in factory procedure.

Perhaps BATH engineers can help give you the "green light" on some particular threading problem that is holding up your production speed and scheduled deliveries. The benefit of years of experience and research is yours for the asking.

INSIST ON BATH TAPS
— PROFIT BY THEIR
PLUS — PERFORMANCE

JOHN BATH CO. INC. WORCESTER MASS

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

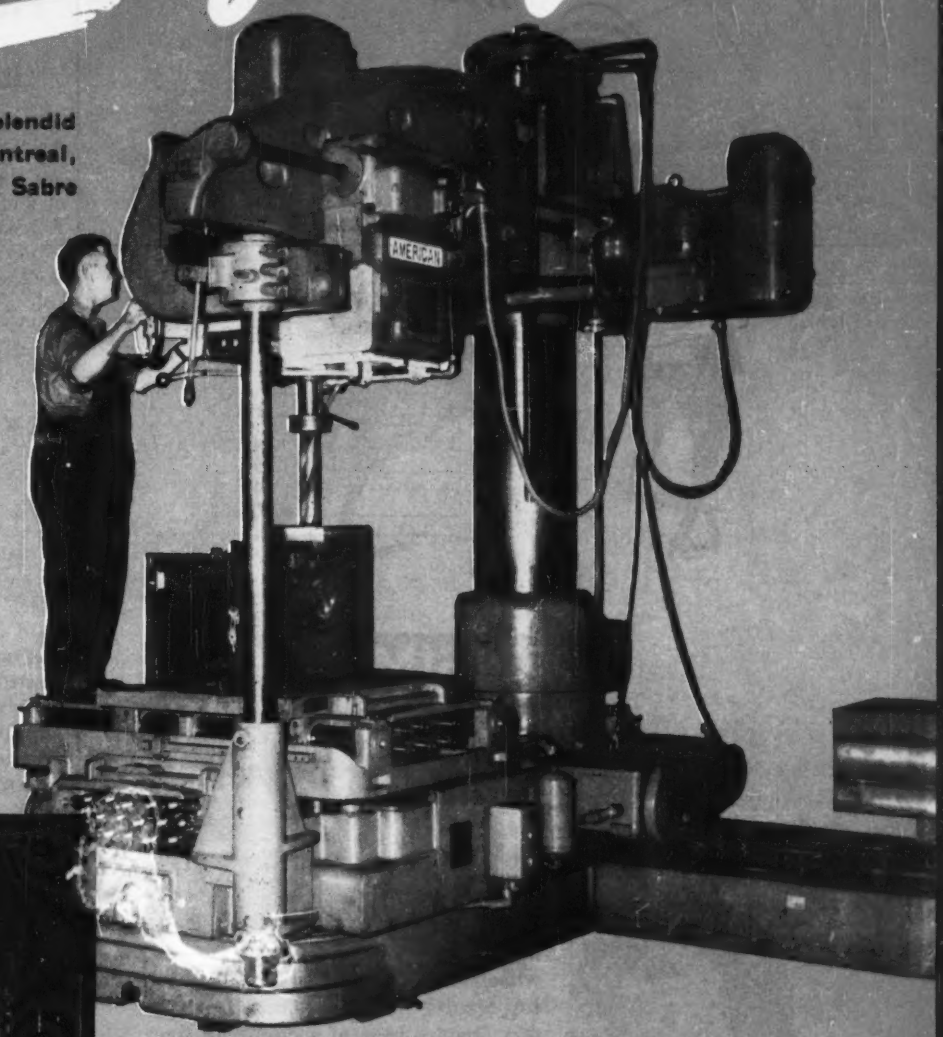
JOHN BATH CO. INCORPORATED

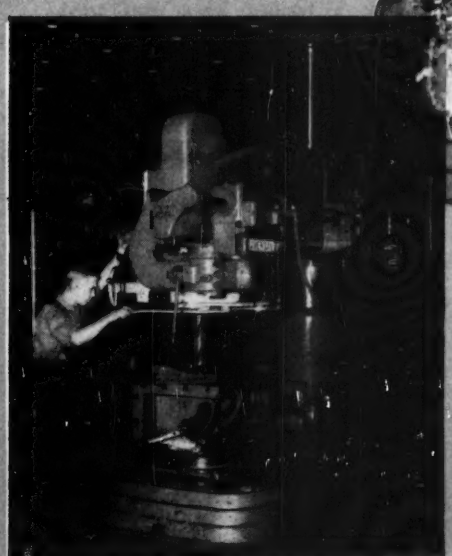
24 Grafton St., Worcester, Mass.

On TOP of his job!

This operator is doing a splendid job at Canadair Limited, Montreal, on the production of F-86E Sabre Jets for the RCAF and, as the illustration shows, he is right on top of his job, too.

He is proud of his fine new 6' 17" column "AMERICAN" Hole Wizard Radial. "It's powerful; it's sturdy; it's easy to operate, and I'm not worn out at the end of the day". What more could any operator ask? As a consequence he turns out a lot of fine work which makes his machine a paying investment for the company.





This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

"AMERICAN" Hole Wizard Radials are playing a prominent part in the production of critical defense items for both the U. S. A. and Canada.

For a complete revelation of their virtues send for descriptive bulletin No. 327.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Pretty smooth grinding these days, Jim!



SIMONDS ABRASIVE CO.

Grinding Wheels



It's inspection OK's instead of KO's since Simonds Abrasive Company wheels were put to work in the grinding room. Why? Because Simonds wheels are accurately specified to give top results on the jobs they have to do. They're part of a complete line containing everything to smooth your way to real production efficiency . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(Advertisement)

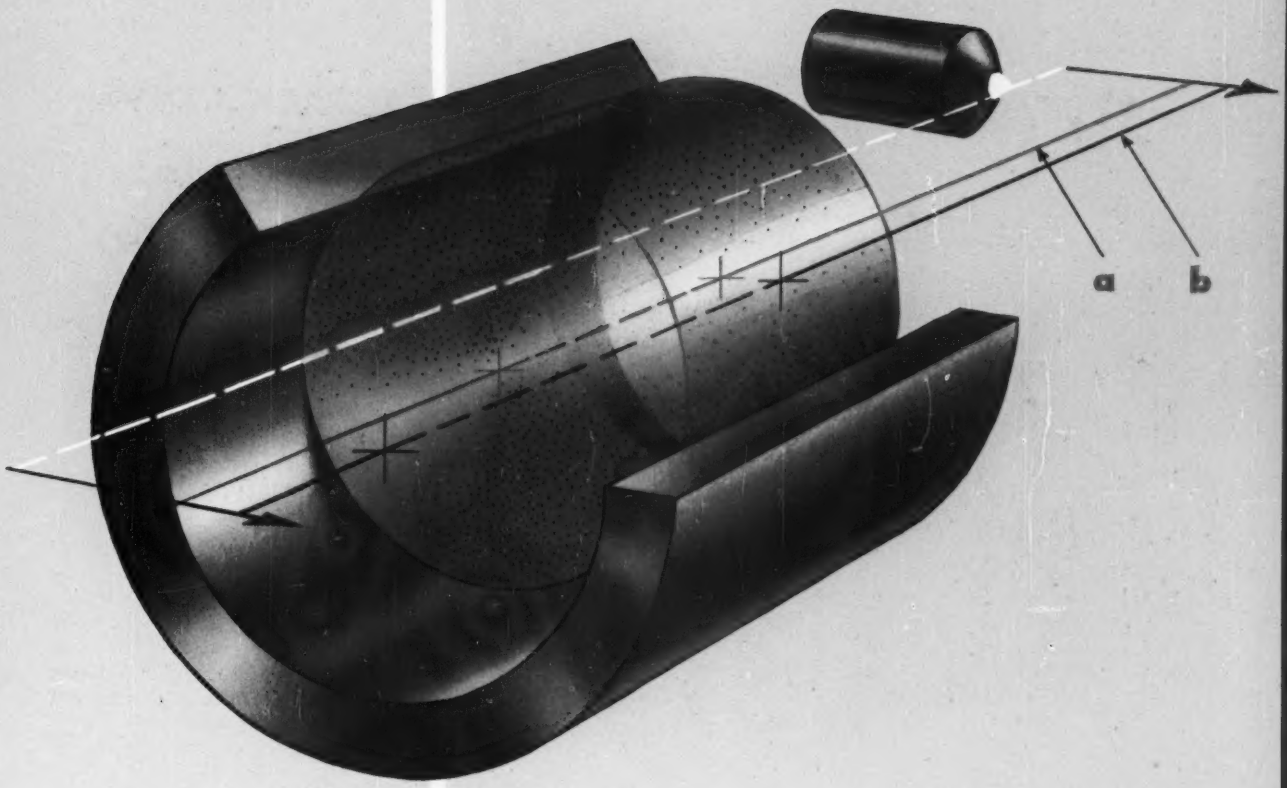
Yesterday's Grinding Problem is Today's Grinding Solution

"Talking about toolmakers . . . take my Uncle Ed." said the Philosopher, clipping the end of his cigar. "Uncle Ed was tops. An ace toolmaker. Worked for a Providence shop during the Civil War."

The Philosopher sent an aromatic cloud of cigar smoke wafting overhead. "The sewing machine was the big production number then," he continued. "The Willcox & Gibbs sewing machine. The first piece of delicate machinery made for the lady of the house. The boss figured it would have to take plenty of abuse, so he decided to make the shaft and needle bar of tool steel with the highest finish possible." The Philosopher hunched forward in his chair. "Well, sir, there was only one man who could be entrusted with the job, Uncle Ed. The parts were finished by grinding . . . perhaps the first instance of its kind. It was done with a steel disc with a leaden edge impregnated with emery. Later a bonded wheel was tried. Uncle Ed wet the wheel with a sponge and placed a dish of water below to catch the sparks. Later he introduced water to the workface through a tube."

"Yes, sir, getting a high finish in those days was a tough job. Enough to drive a man crazy. As a matter of fact, Uncle Ed was eventually stricken with some sort of brain ailment. Didn't go raving crazy, you understand. Just became sort of vague and unpredictable. Lived out the rest of his days apart from the family in a doddering state of amicability."

"Now, the only reason I mentioned Uncle Ed is to illustrate a point," said the Philosopher, neatly slicing an inch of cigar into the African violet pot. "And the point is this: ninety years ago a man could go crazy trying to get a superlative finish by grinding. Today he would go crazy trying to get a superlative finish *without* grinding."



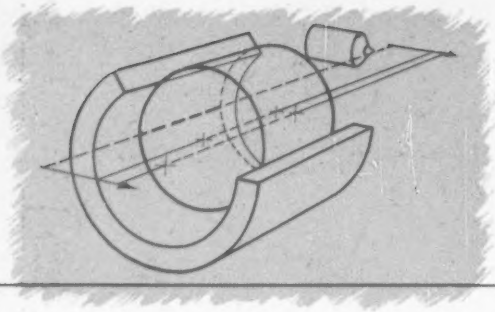
bryant
internal grinding

THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must be parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

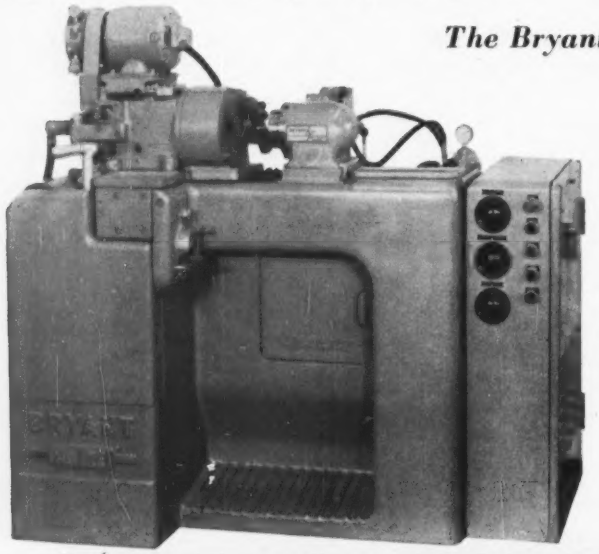
Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.

Bryant Chucking Grinder Co. Springfield, Vermont



bryant
internal grinding

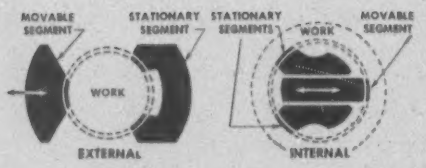
Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.



The Bryant 1109 Precision Internal Grinder

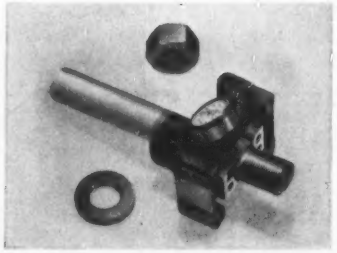
THIS semiautomatic machine is intended primarily for grinding bores under 1" diameter. It has chuck swing of 9" and maximum grinding stroke of 3½". Sensitivity with rigidity are obtained by using preloaded ball slides for both cross and longitudinal movements, which transmit load directly to machine base. The Bryant Hi-Frequency Wheelhead is standard equipment, and provides speeds up to 100,000 R.P.M. for efficient surface speeds on small diameter work. Write for full information.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.



bryant
thread gaging

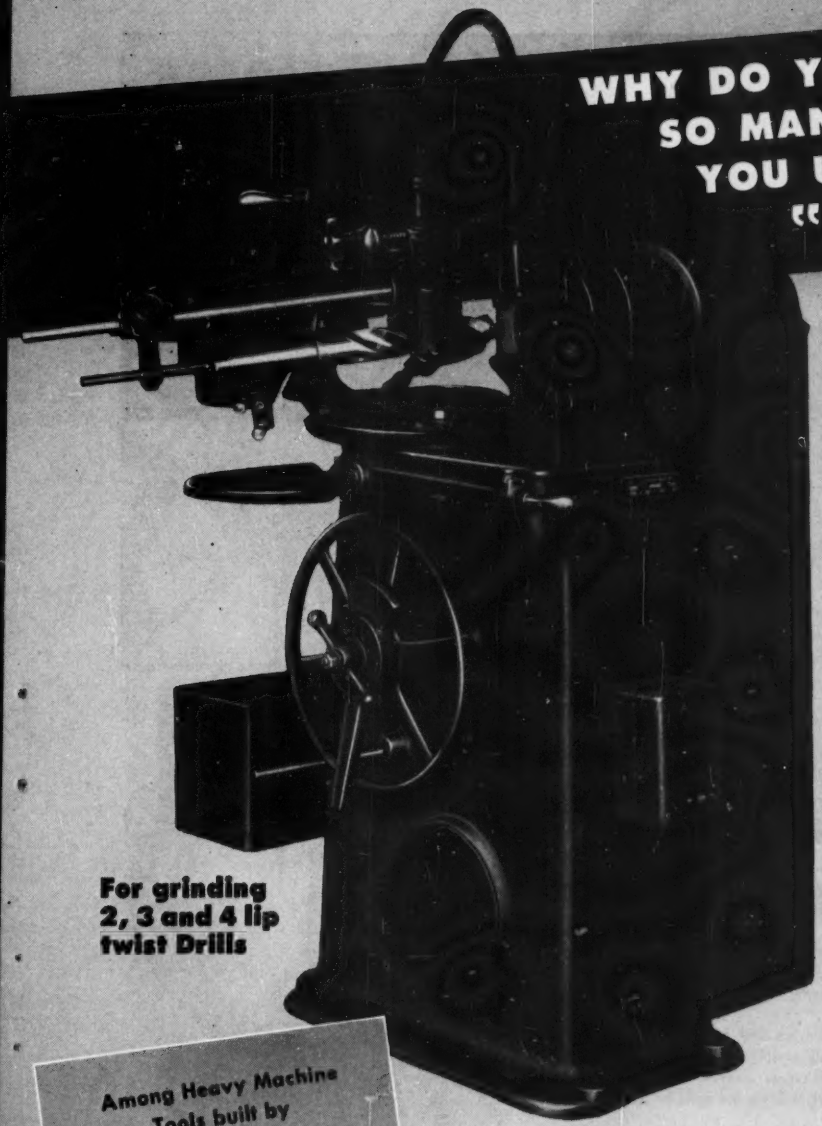
Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assembleability.



The Bryant P-11 Portable Thread Gage

THIS is basically a split plug gage, equally effective for bench inspection or for gaging internal threads on parts still held in the machine, or in large work that is difficult to move to the inspection department. *4 to 5 times faster than plug gaging!* Standard range from 5/16" to 5" in diameter. Write for catalog describing full line of Bryant Thread Gages.

WHY DO YOU SUPPOSE SO MANY OF THE DRILLS YOU USE COME TO YOU "Sellers Ground"?



For grinding 2, 3 and 4 lip twist Drills

It's because . . .
Leading Drill manufacturers use Sellers Drill Grinders to point grind their drills. They also recommend them for maintaining their customers' drills at top efficiency.

SELLERS DRILL GRINDERS CUT DRILLING COSTS THROUGH . . . . INCREASED PRODUCTION. Free cutting, accurate drills permit drilling machines to be operated at their most efficient speeds.

LONGER DRILL LIFE. Less drill material is ground off when re-sharpening drills.

MORE HOLES PER GRIND. Correctly ground drills remain sharp for a greater number of holes.

REDUCED ASSEMBLY COSTS. Eliminates under- and over-size holes. Saves reaming and boring.

RECLAIMS DAMAGED DRILLS. Sellers grinding method reclaims many burned and broken drills that are ordinarily scrapped.

ECONOMICAL. Sellers Grinders have been known to earn their cost as many as six times over within one year. Readily operated by skilled or unskilled operators.

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

SELLERS No. 6-G DRILL GRINDER

A wet grinder especially adapted to grinding high speed twist drills from 1/16" to 3" diameter, this machine provides a distinctly improved method of grinding that produces correctly formed drill points with duplicate lips. It automatically determines proper clearance according to drill size and grinds drills to equal length for use with multiple spindle drilling machines. Among other advantages, this method materially reduces drill maintenance costs. Other Seller Drill Grinders are available in sizes to handle drills down to .028" (No. 70) diameter. Built to last, Sellers Drill Grinders have an unusual record for long operating service, with some in operation for thirty years and longer. With ordinary care, part replacements are negligible, however when required, replacement parts are always available. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

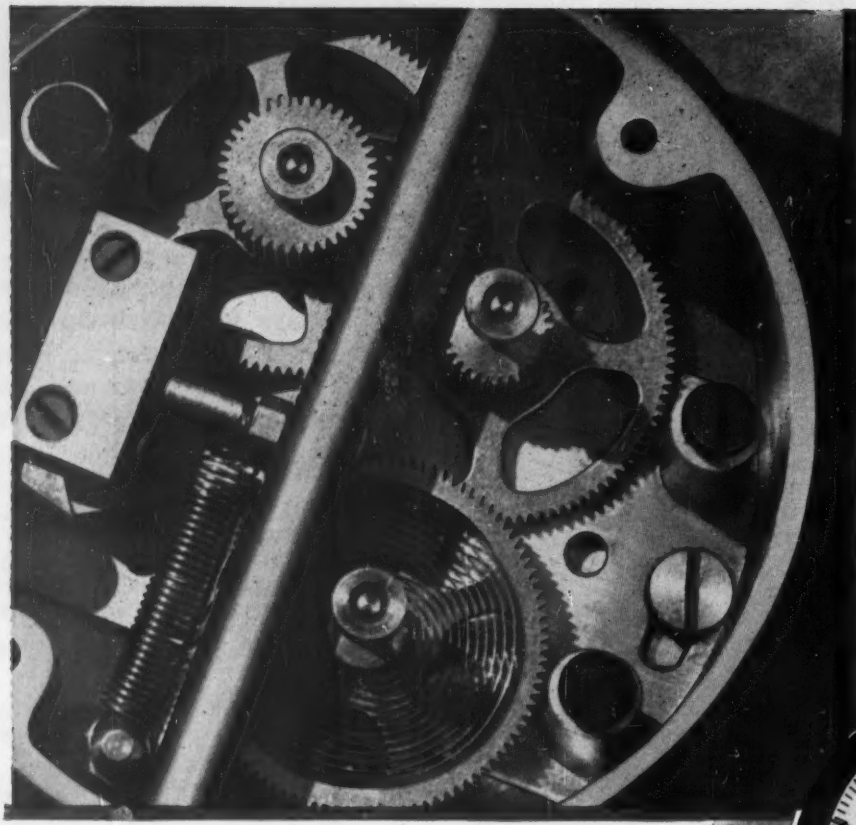
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

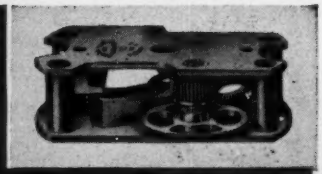
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

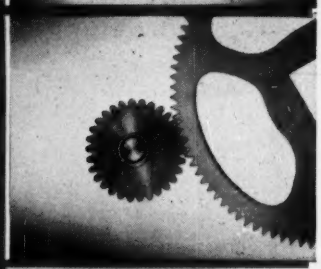
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

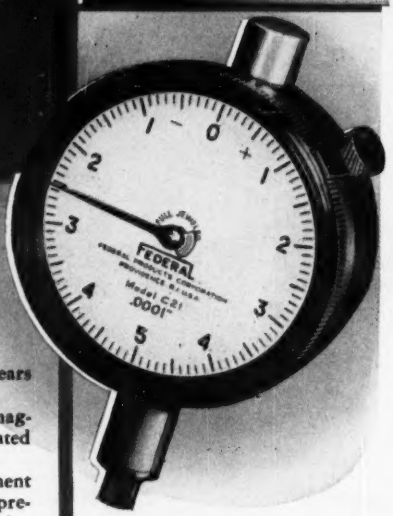
ROCHESTER, NEW YORK











The Dial Indicator Built as Fine as the Finest Watch

Today the Dial Indicator is built mechanically as fine as the finest watch, for years the standard of comparison for fine manufactured articles.

The distance the contact point of a Dial Indicator moves must be accurately magnified by its rack and gears so that the amount of this distance will be accurately indicated by the dial graduations.

Gear teeth must be so designed and precisely cut they will magnify the movement of the contact point accurately and positively. All bearings and bushings must fit precisely so there is no lost motion and yet they cannot fit so tightly as to cause excessive friction. Inertia must be held to a minimum. All these details are necessary if a Dial Indicator is to be sensitive to slight dimensional variations.

A Dial Indicator must have exceptional fidelity in order to always "repeat" the same reading for the same amount of variation.

And, finally, a Dial Indicator must have the stamina and durability to withstand sudden shock and rough abuse.

At Federal Products Corporation we are constantly aware of the importance of these requirements. Federal leads in the development of Low-Friction, Low-Inertia, Full-Jeweled Indicators. Federal's top and bottom movement plate construction has long defied improvement and Indicator maintenance men prefer it to all others.

Send for Federal's latest catalog showing the most complete line of Dial Indicators and Indicating Gages. FEDERAL PRODUCTS CORPORATION, 1119 Eddy Street, Providence 1, Rhode Island.

ABOVE ILLUSTRATIONS
(Top to Bottom)

Note rigid assembly of top and bottom plates and massive support for pinion bearing — features which mean long lived accuracy.

•

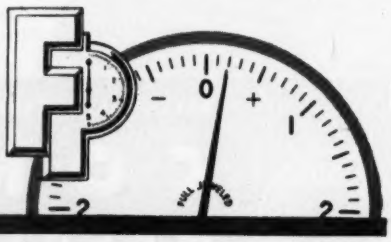
Bottom plate of heavy gage brass showing jeweled bearings and precision workmanship.

•

Teeth of gears and pinions are cleanly cut — not stamped — and they mesh accurately.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES





Card boosts production from 90 holes per tap to 18,000!

CARD TAPS

Producing armament parts for the government, a large metal-working firm was tapping extruded holes in thin steel for size ⅜-24 screws. Taps used were Card three-flute, spiral pointed, high speed steel, commercial ground. Due to the low carbon, low sulphur content of the steel part, it became welded to the taps after 48 to 90 holes — so that holes were reamed or drilled out, leaving no threads.

Card technicians tried various cutting oils and other styles of taps without effect. Then, deciding that a dissimilar metal was needed between the tool and the work, they recommended chrome-plating the taps.

Results: The chrome-plated taps averaged 18,000 holes each, perfectly tapped to a No. 2 fit. One tap completed 35,000 holes.

SEE YOUR CARD DISTRIBUTOR FOR PROMPT DELIVERIES AND HELPFUL SERVICE

Your Card representative, backed by Card's expert engineering staff, is always available for aid in any tapping problem. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts. Division of Union Twist Drill Company.

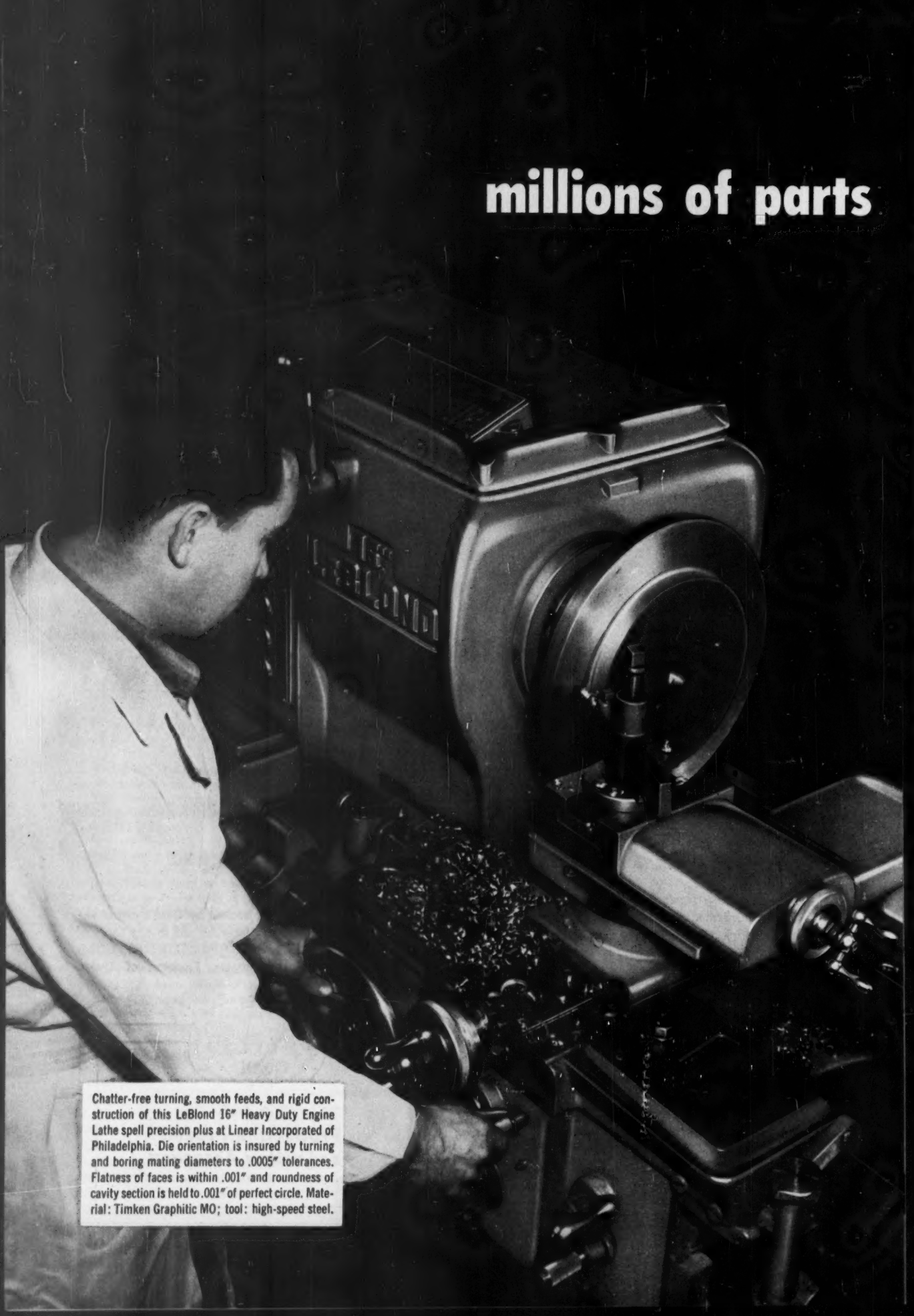
The CARD Quality

TAPS

Production Proved For Lasting Accuracy

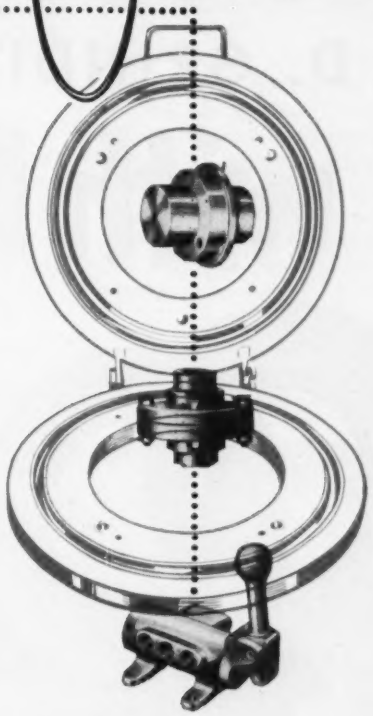
Also makers of DIES • SCREW PLATES • DIE STOCKS TAP WRENCHES

millions of parts



Chatter-free turning, smooth feeds, and rigid construction of this LeBlond 16" Heavy Duty Engine Lathe spell precision plus at Linear Incorporated of Philadelphia. Die orientation is insured by turning and boring mating diameters to .0005" tolerances. Flatness of faces is within .001" and roundness of cavity section is held to .001" of perfect circle. Material: Timken Graphitic MO; tool: high-speed steel.

are married with rings like these



Industry needs sealing rings to "marry" millions of parts against leakage of air, liquid, and gas. Seals, for example, like the rubber "O" rings made by Linear Incorporated of Philadelphia. They're vital to the successful operation of hydraulic mechanisms, air-operated devices, and chemical processing equipment . . : to name just a few applications. And industry says, "Make these sealing rings to precision tolerance for non-leakage. Deliver the millions we need at low cost."

Linear experimented . . . found that "O" rings with the required finish and roundness could be mass-produced easily enough . . . but to turn them out at low cost demanded virtual elimination of hand-finishing operations. The problem called for dies made to tolerances that would deliver cross-sectional roundness conforming to nearly "perfect circle," mating diameters so accurate that perfect die orientation could be achieved.

Then Linear installed their new 16″ LeBlond Heavy Duty Engine Lathe. This profit-building lathe is saving expensive toolroom time and delivering cavity finish on Linear's dies as fine as 10 microinches, mating diameters to the required .0005″ whisker of tolerance, cross sectional roundness within .001″ of perfect circle. Costly die-finishing time at Linear is down . . . flash-removing second operations on "O" rings are at a bone-bare profit-making minimum. It's a case of chatter-free turning, smooth-as-silk feeds, and rigid construction.

LeBlond features like hardened and ground self-compensating steel bed ways, totally enclosed quick-change box, one-piece apron and a host of others will insure Linear a lifetime of this same smooth-turning performance.

Whether you need unfaltering accuracy or high output rapid production, there's a LeBlond lathe that will fill the bill. Your nearby LeBlond distributor will tell you about our complete line. Call him or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

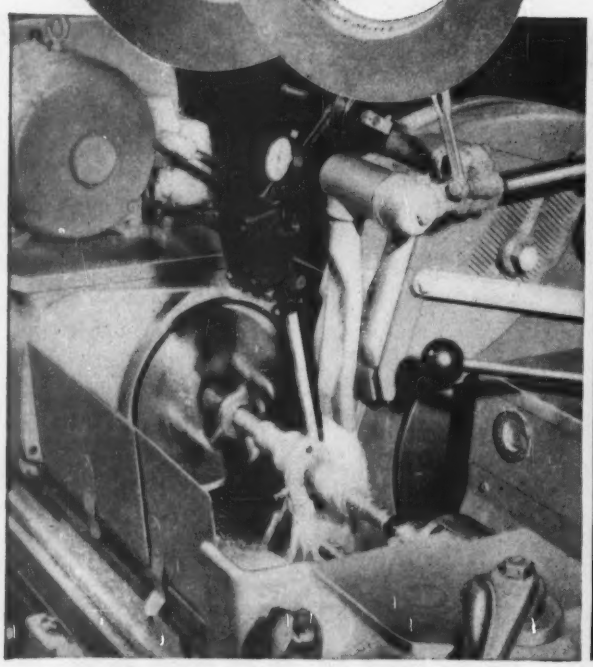
Ask for Bulletin HD125 D
for more information on the 16″
LeBlond Heavy Duty Engine Lathe

turned faster by LeBLOND of Cincinnati

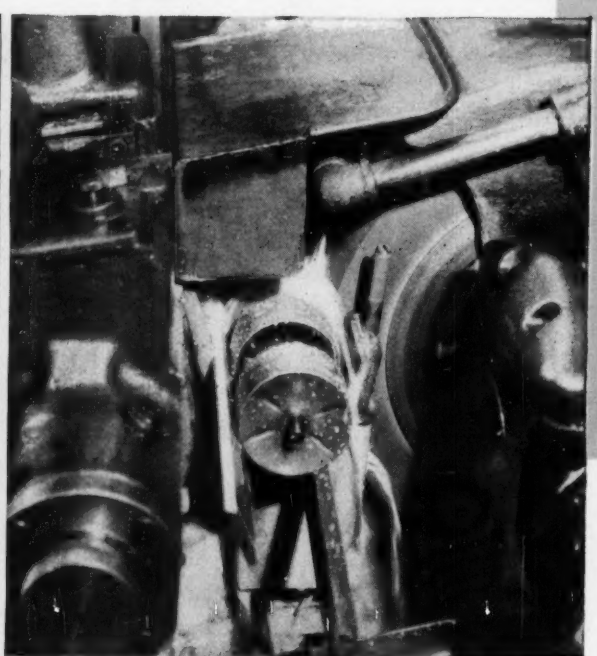
WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 64 YEARS

Protect YOUR O. D. GRINDING INVESTMENT with Norton Wheels





Cylindrical grinding small shafts on a production basis.



Plunge-cut centerless grinding of textile machine pulleys.

NORTON
ABRASIVES

Making better products

Buying machines for O.D. grinding — cylindrical or centerless — is a sizable investment, to which you give a lot of serious thought. But remember:

No chain can be stronger than any of its links — and no grinding machine can be more efficient than its grinding wheels.

That's why it will pay you to weigh every condition carefully in your selection of the right grinding wheel. Because without the *right* wheel the costliest grinding equipment will not pay off for you as it should in more production at lowest possible cost.

Then consider this:

No matter what your O.D. grinding jobs are, Norton makes wheels that are exactly right for them. And your Norton Distributor is ready to tell you exactly which wheels you need.

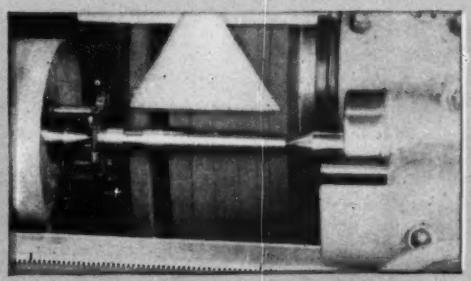
Norton Safeguards for Lower-Cost Grinding

Norton Abrasives, ALUNDUM* (fused alumina) and CRYSTOLON* (silicon carbide) are made in a variety of types and grain sizes for best results on every material handled in cylindrical or centerless grinding.

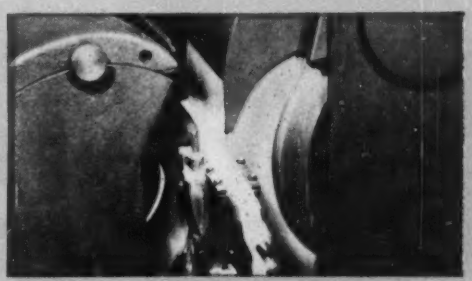
Norton Bonds, vitrified, resinoid, shellac and rubber are available for cool, free cutting action, extra long wheel life and just the finish you want.

Norton Service includes the most comprehensive applicational aid in the field. In practically every case your Norton Distributor can quickly tell you the correct sizes and types of wheels to use. And if your problems are unusual, he can call on a Norton Abrasive Engineer to give you double assurance of the right wheel for every job.

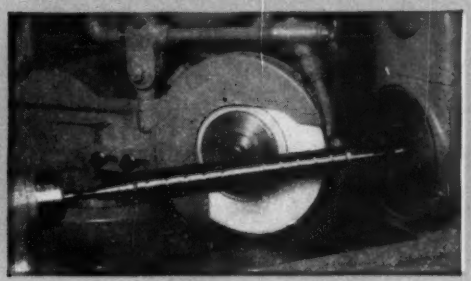
These O. D. Grinding Machines Are Paying Off...WITH NORTON WHEELS



Wheels must be uniform in this cylindrical setup for grinding seven diameters at once.



Through-feed centerless grinding gives high production.



Cylindrical shoulder grinding, with wheel head swiveled to 45° angle.



Plunge-cut grinding to a shoulder in a centerless machine.

Test Your I.Q. on O.D. Grinding

How many of these questions on cylindrical and centerless grinding can you answer correctly?

- *What is the usual range of wheel speeds in these types of grinding?*
- *What conditions prevent wheels from cutting freely?*
- *What are the causes of chatter marks?*
- *When should a filter be used in the coolant system?*
- *What adjustments can you make if a wheel is acting soft? . . . if it is loading or glazing?*
- *What factors govern the choice of abrasives, grain sizes and bonds in wheels for O.D. grinding?*

You'll find answers to these and many other everyday questions on O.D. grinding applications — together with convenient selection charts for your general guidance — in this handy illustrated booklet. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding,* or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.



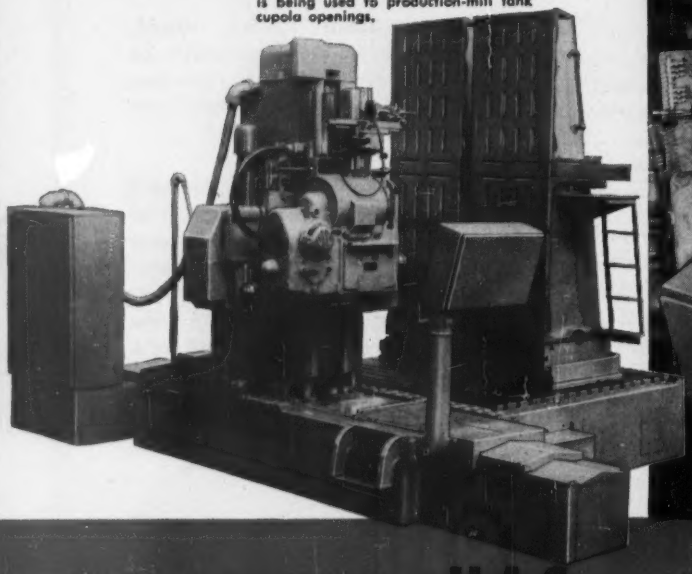
to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

TYPE

BG-21

Made with work capacities ranging from 5 feet to 10 feet horizontally and 2½ feet to 4 feet vertically, in single spindle and two-spindle types, this latest model in the KELLER line incorporates all the advanced features of the larger Type BG-22. In this KELLERING operation, profiling control is being used to production-mill tank cupola openings.



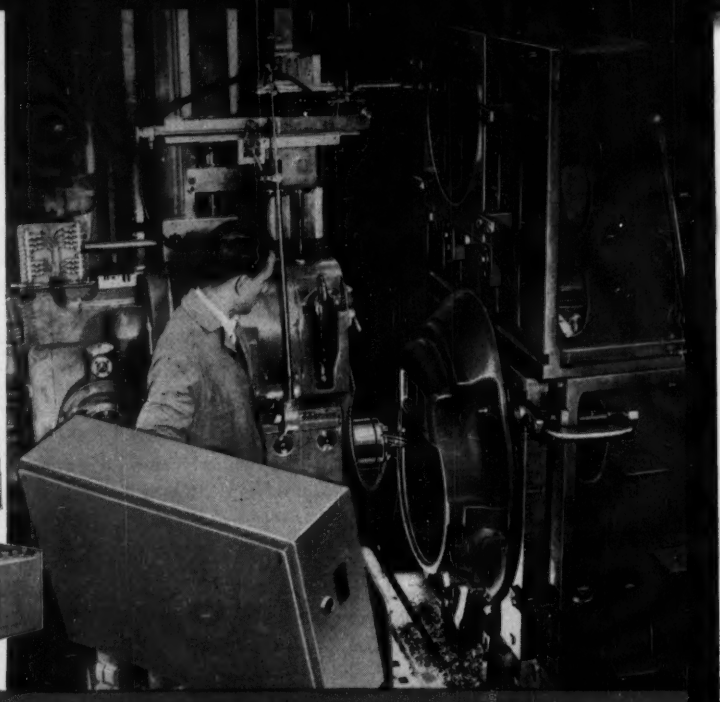


PHOTO COURTESY E. D. JONES & SONS CO., PITTSFIELD, MASS.

INDUSTRY HAS A WORD FOR IT . . .

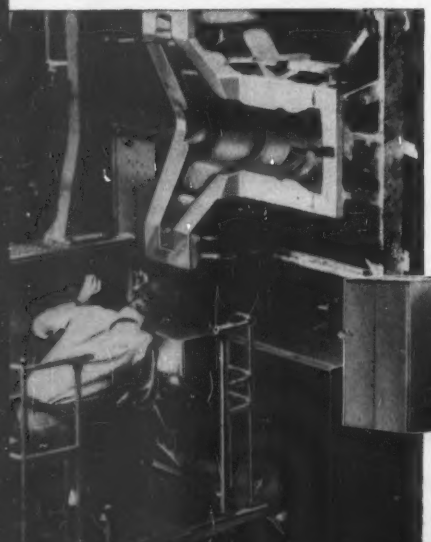
KELLERING

Fast, Accurate, Economical Reproduction

TYPE

BG-22

Largest in the KELLER line, the huge BG-22 is made with work capacities ranging from 10 feet to 20 feet horizontally and 5 feet to 7 feet vertically, in single spindle and three-spindle types. Widely used in the automotive industry, it is shown here KELLERING a forging die for a non-ferrous press forging for the aircraft industry.



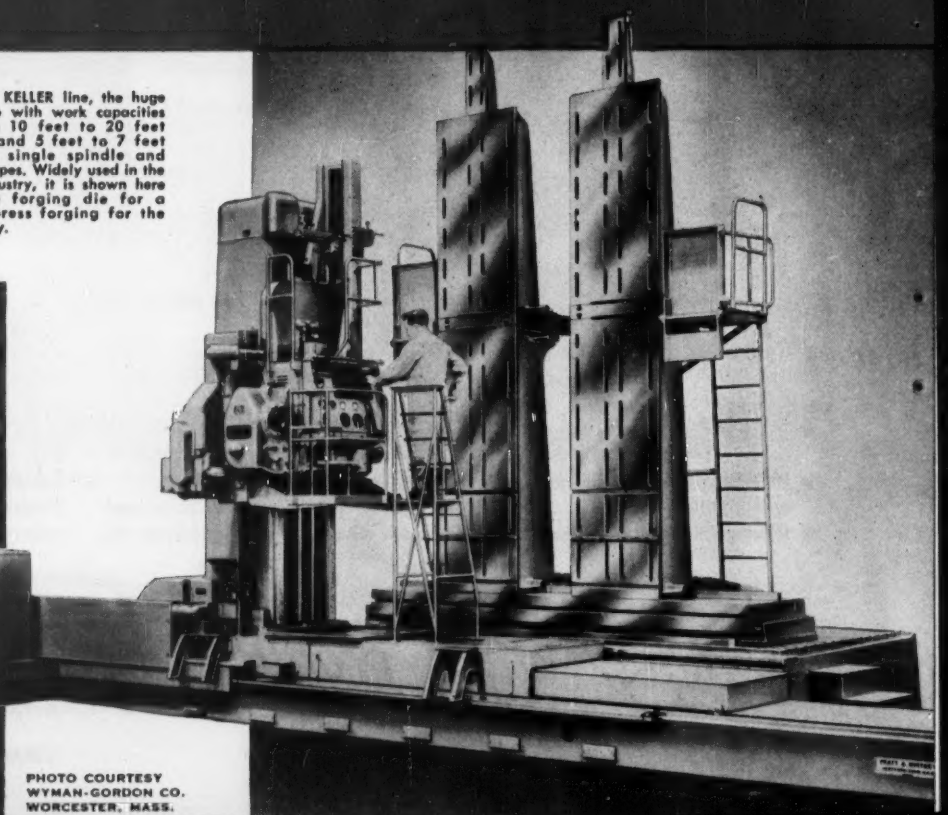


PHOTO COURTESY
WYMAN-GORDON CO.
WORCESTER, MASS.

TYPE

BL

Designed specifically to handle the smaller jobs economically and efficiently, the Type BL is made in two sizes for work areas of 24" x 16" and 36" x 20". A three-spindle machine is also made for the production manufacturing of small parts. The photo at right shows a single spindle machine cutting a precision die casting die in steel from a wood master.



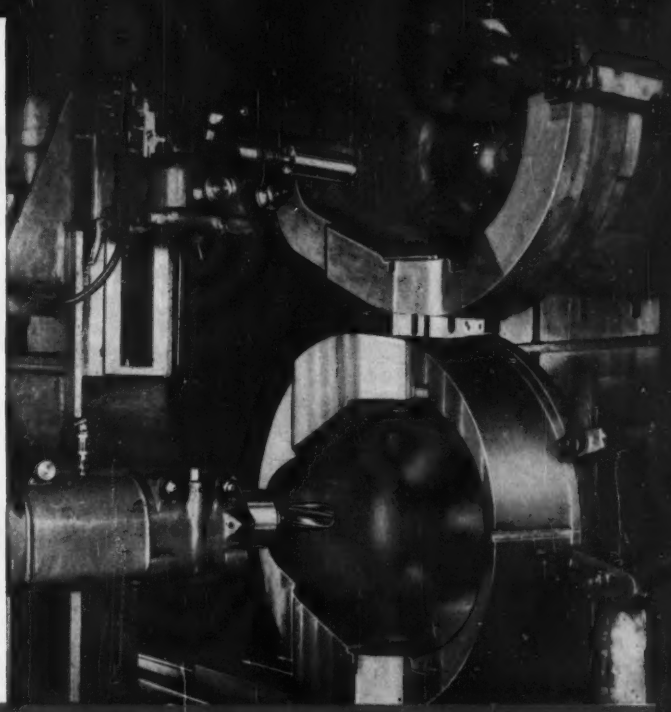


PHOTO COURTESY STERLING ENGINEERING CORP., WINSTED, CONN.

with PRATT & WHITNEY KELLER MACHINES

Automatic Tracer-Controlled Milling

Experience gained during nearly 40 years of designing and building tracer-controlled milling machines combined with Pratt & Whitney's over 90 years of manufacturing precision tools has made the P&W-KELLER Machine the finest of its kind ever produced. It has become so basic and so popular in industry that this type of machining is now universally known as "KELLERING".

Pratt & Whitney-KELLER Machines are powerful, horizontal spindle millers controlled by an electric tracer. They faithfully reproduce the shape of any 2- or 3-dimensional master form or pattern. Very complicated shapes are duplicated as economically as simple work. Designed specifically for tracer-controlled milling, KELLER Machines are unequalled for speed and accuracy, total machining time is much less than that required by any other method, and a minimum of hand finishing is needed. In the production of dies, molds, punches and in many other duplication jobs, you can look to P&W-KELLER Machines for new standards of speed, accuracy, convenience and economy. A complete line, with a wide range of work capacities, makes any job the right size for "KELLERING".

Write on your Company letterhead for fully descriptive KELLER Bulletin No. 490-2 for the smaller work sizes or Bulletin No. 537 for large work.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.



No. 537 No. 490-2

First Choice for Accuracy

Branch Offices . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • HOUSTON (The Stanco Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

CUTTING TOOLS • GAGES • MACHINE TOOLS

Get the most out of your

LELAND-GIFFORD DRILLING MACHINES

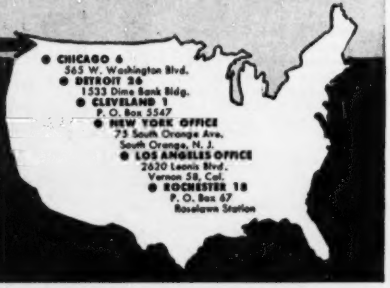


Watch those STOP NUTS...

On machines equipped with power feed, never use stop nuts on the depth screw. Provision for accurately setting the depth of feed is built into the power feed mechanism. The use of stop nuts on the depth screw above the sliding head can result in serious damage to the spindle or power feed mechanism.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

***SAVE TIME*— CONTACT THE OFFICE NEAREST YOU**



LELAND-GIFFORD

Drilling Machines

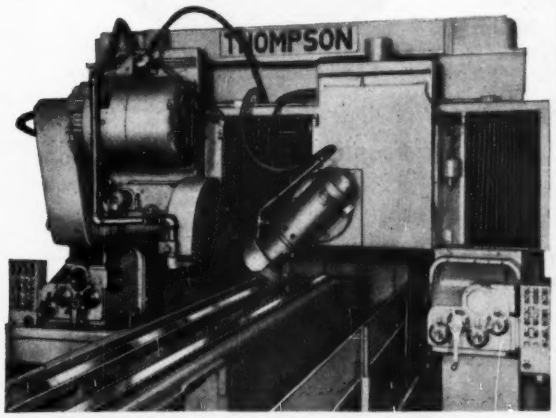
WORCESTER 1, MASSACHUSETTS, U.S.A.

New Thompson Way Grinder Developments

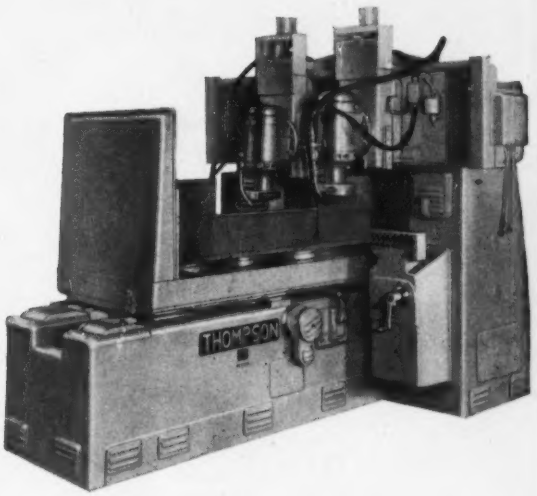
Reduce Costs ... Speed Machine Tool Production

Way Grinders now available with single, multiple heads, or combinations of horizontal and vertical heads and in sizes to meet all requirements.

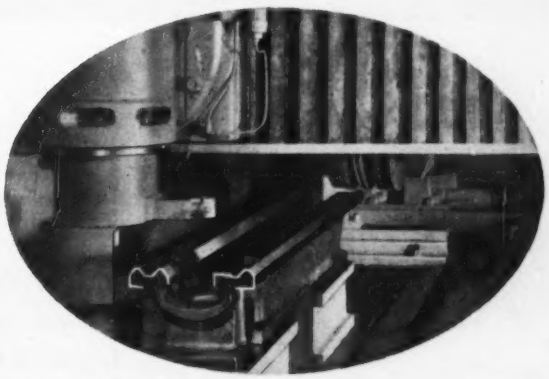
Thompson has produced machine tool way grinders in many types and sizes that have eliminated hand-work and produced economical and accurate ground ways. However, recently increased production grinding of ways has been made possible by many new Thompson Way grinding developments such as: automatic grinding and truing cycles; dual vertical or horizontal heads for grinding ways different heights; horizontal multi-wheel grinding and vertical side and undercutting head; Hydrail way grinding for giant columns or bed ways. Three of the new Thompson Way Grinders are shown here.



Designed especially for extremely large machine tool way grinding is this typical Thompson Hydrail Way Grinder. Size 48″ x 48″ x 192″. Part: grinder bed ways.



One of several new Thompson Double Head Dovetail Way Grinders installed to speed work and hold accuracy in the plant of a leading lathe manufacturer.



Multi-wheel grinding with auxiliary vertical head. Equipped with horizontal spindle having dual spaced wheels and auxiliary inclinable spindle. The front contoured grinding wheel grinds the rear set of ways and the rear grinding wheel grinds the front set, with vertical head grinding the sides and undersurface of the ways and rack seat.

Write for details Today.

The Thompson Grinder Company, Springfield, Ohio

Thompson SURFACE Grinders

Copyright 1952—The Thompson Grinder Co.



Carlton customers

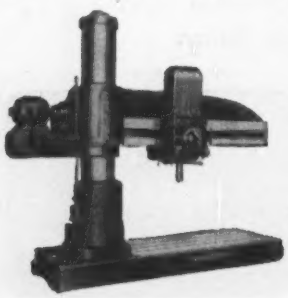
GET HOLE DRILLING EFFICIENCY AND ECONOMY!

CARLTON RADIAL DRILLS provide generous capacity and tremendous power, yet are extremely accurate. Miller Printing Machinery Co., Pittsburgh, says:

"When compared to the ordinary drill, this huge Carlton radial (above) is gigantic and yet it is precise and accurate."

THAT PRECISION COMES FROM enlightened Carlton designing, engineering and manufacturing . . . and from an intimate knowledge of your radial drill requirements acquired in sixty years of experience.

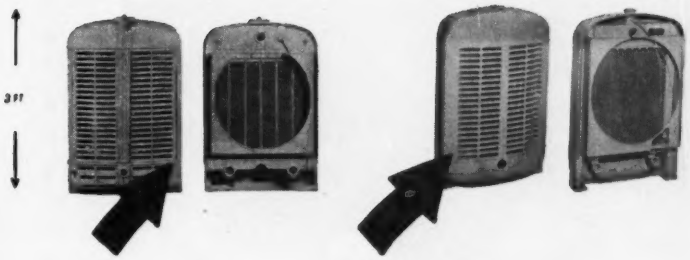
Be sure to check Carlton before you buy your next radial drill. Ask for descriptive bulletins today.



Carlton

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

The trend is to more stampings WITH Bliss PRESSES

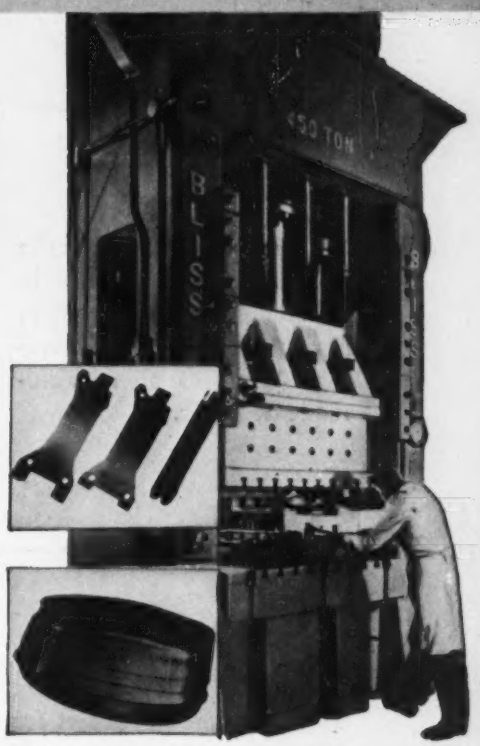


Casting-to-Stamping saves as much as 30% for Young Radiator Company

When Young Radiator Company, Racine, Wis., decided to redesign their line of automotive and industrial radiators, their thoughts turned to lighter, stronger, more clearly designed components. To gain these new design objectives, they converted from castings to stamped steel parts. And as they had done for 20 years, they asked Bliss to specify the right press for the job.

Bliss engineers studied the problem, recommended a 450-ton single-action Hydro-Dynamic press. Result: savings up to 30 percent; weight of the radiators halved; strength increased.

Says President F. M. Young, "We've long been advocates of Bliss presses and service." Proof of the statement is the fact that 70 percent of Young's pressroom is Bliss. Why not bring *your* metal-forming problem to Bliss? You'll find—as Young Radiator did—that Bliss has a press for almost every metal-forming operation.



Shown here are the second and third forming operations on radiator side members (inset, top). A third die handles initial piercing. A Bliss hydraulic cushion ejects the stamping... is also used as blankholder to draw the shell. Shells are center-split to form top and bottom of radiator housings (inset, bottom).

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

Bliss

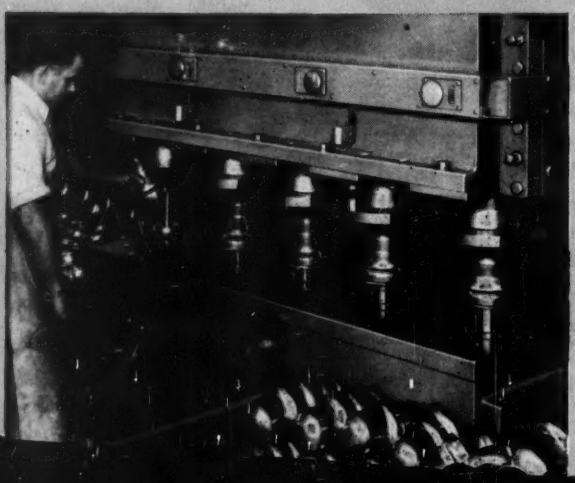
on your press is more than a name... it's a guarantee!

NIAGARA

SERIES B
GAP FRAME Double Crank Presses



Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.



The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.

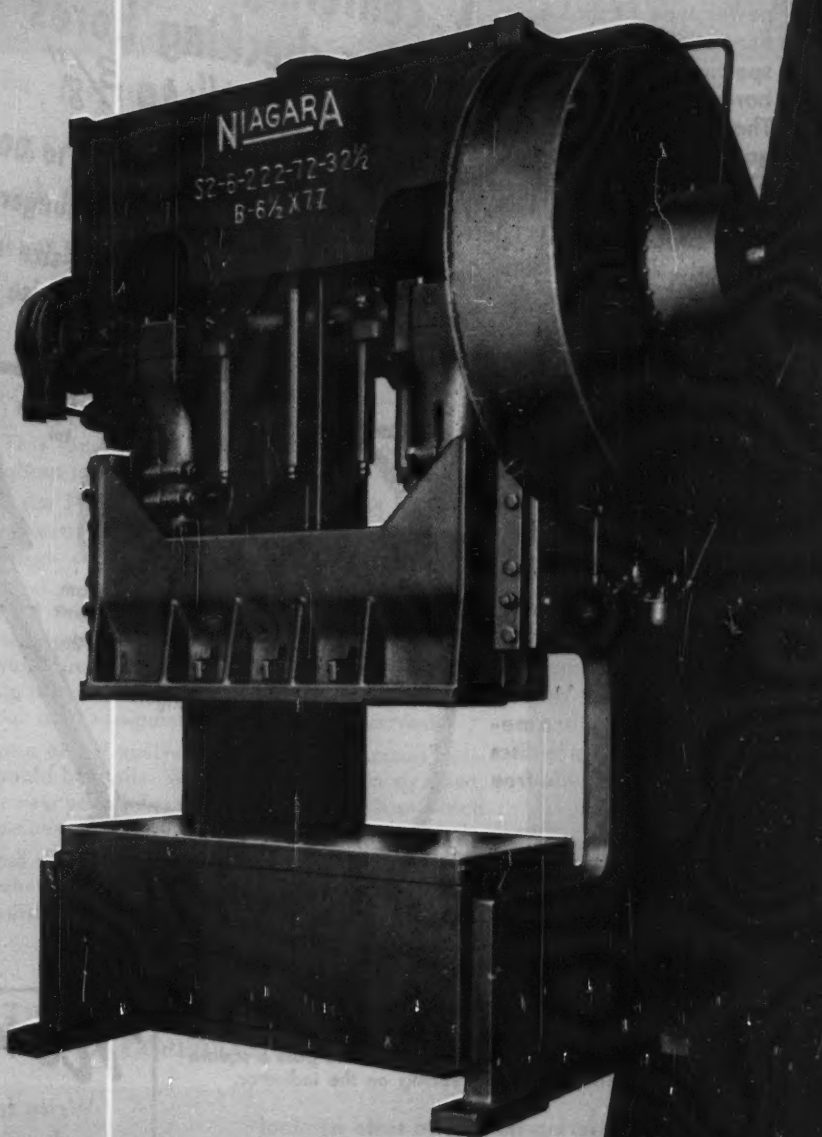
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

Versatility and High Production

- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

Write for Bulletin



Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

DISTRICT OFFICES: NEW YORK • CLEVELAND • DETROIT • PHILADELPHIA

MINOR in size yet a MAJOR new addition to STANDARD DIAL BORE GAGES

YES, Standard Gage, pioneer of dial bore gages, has developed a still newer type of dial gage for quick, accurate inspection of small diameter bores from .250" to .375". The ultimate in precision gaging of small bores, STANDARD'S No. 00 is based on an entirely new "interchangeable disc" principle, surprisingly simple in design, easy to set and easy to use.

- Readily entered in bore
- Holds its setting
- Gives positive repeat readings
- High visibility dial graduations of .0001" are easy to read

Sapphire tipped gaging plunger and chrome-plated centering-size discs insure a long, trouble-free gaging life.

NEW #00 uses centering-size discs for checking bores from 1/4" to 3/8"

★ Designed for tolerances up to .005"
★ Sapphire tipped gaging plunger
★ Chrome plated centering-size discs assure long "precision-service"



Photograph actual size

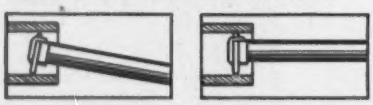
Patent Applied For

Enlarged diagram shows easy assembly of centering-size disc on plunger.

New centering-size disc

A turn of the knurled clamping nut releases centering-size disc or locks it firmly in place.

EASE OF OPERATION



Gage is entered at an angle to allow extended plunger to clear the bore, then rocked to cause plunger to pass a square position while noting minimum reading on the indicator.

When ordering be sure to state nominal size of bore and tolerance desired

EASY "SIZE CONVERSION"

Conversion to various sizes in the range from .250" to .375" is accomplished by the quick interchange of centering-size discs on the same head by the one-step operation of turning a clamping nut. Positive locking action of this nut insures holding set dimension. Centering-size discs are furnished to suit dimensions of bore to be checked. No. 00 will check to within 1/16" of the bottom of a blind hole.

Now 8 sizes cover range of 1/4" to 16" in STANDARD'S line of Dial Bore Gages.
Write for new complete Catalog C showing these and other gages.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



Draper Corporation plant at Hopedale, Massachusetts

How DRAPER'S Equipment Replacement Program Helps Top Management Make Profitable Decisions

"The Draper Corporation, world's largest manufacturer of Automatic Looms, located in Hopedale, Massachusetts, has had a regular machine tool replacement program for at least twenty years. This can be evidenced by the high percentage of modern equipment located throughout its plants.

"Along with the inauguration of the Planning Department in 1945 went the responsibility for the continued operation of the equipment program which included manufacturing methods and the design of any special equipment not available from machine tool builders.

"In 1949 the Machinery and Allied Products Institute's publication 'Dynamic Equipment Policy' was introduced into our replacement and sales program. The MAPI procedure was thoroughly investigated with test applications being made on all types of equipment, the result being the adoption of the MAPI method of analysis as standard procedure in so far as our own equipment program is concerned.

"The outstanding characteristic of a MAPI analysis is that the final result indicates whether or not replacement should be made. When replacement is signified, the magnitude of the result shows for next year the extent of unnecessary loss which can be incurred by retaining the present equipment.

"Top management makes the final decisions in machine purchases, but these decisions are less difficult to make when the Draper equipment program indicates what cost saving opportunities are available and also what it is costing not to take advantage of these opportunities."

THOMAS H. WEST, *President*
DRAPER CORPORATION

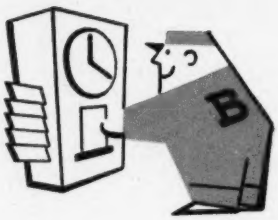


ROCKFORD INSERT GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

SAVE MAN HOURS, WORK HANDLING

BY COMBINED OPERATIONS IN A SINGLE SET-UP!

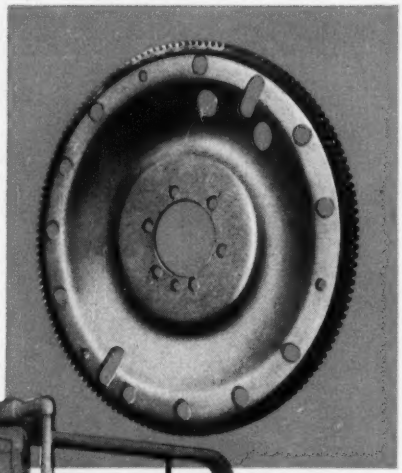


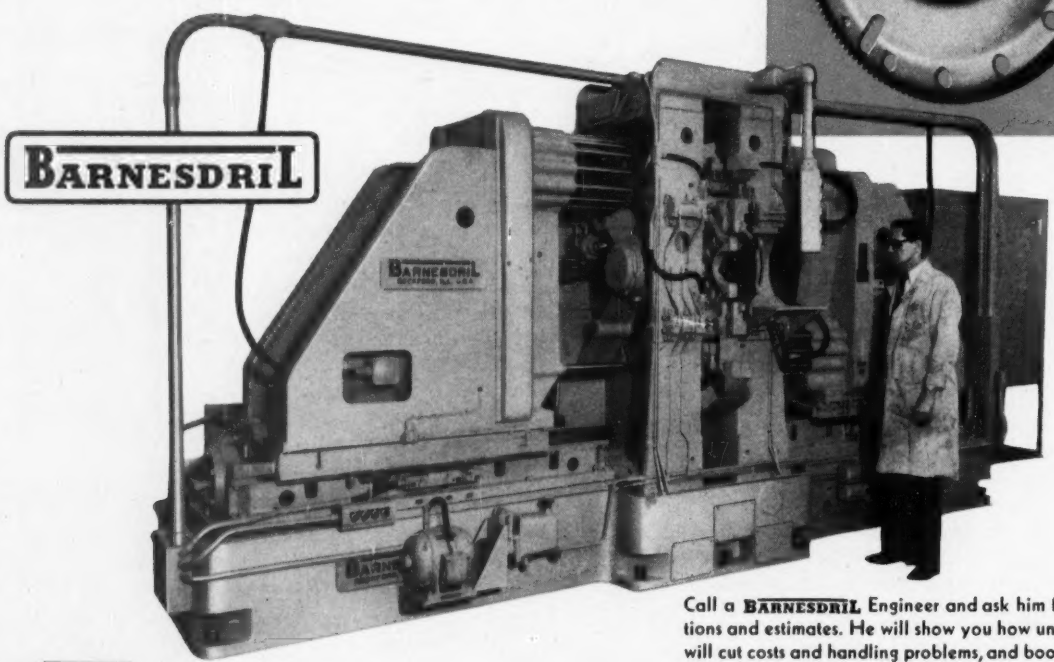
ON BARNESDRIL UNIT-MACHINES

Choose the rate of output and sequence of operations for machining on one of your production parts. **BARNESDRIL** Engineers will arrange these operations into a single automatic cycle to give you the output you need at the lowest possible cost-per-piece.

Straight-line conveyor, transfer-type, or simultaneous multiple operations — machined on rotary index, drum or lateral index fixtures — will give you maximum efficiency, eliminating work transfer-time, and individual machine maintenance and downtime.

This BARNESDRIL 2-Way Horizontal Drum-Type Machine performs 40 operations per piece at the rate of 120 pieces per hour — drilling, chamfering, reaming.





Call a BARNESDRIL Engineer and ask him for specifications and estimates. He will show you how unit-machining will cut costs and handling problems, and boost efficiency.

Complete description of Unit sizes and capacities, with work transfer setups. Write for Bulletin B-150.

BARNES DRILL CO.

320 CHESTNUT STREET • ROCKFORD, ILLINOIS

MADE IN ROCKFORD... MACHINE TOOL SHOPPING CENTER ILLINOIS, U.S.A.



Downtime BECOMES *Production Time*

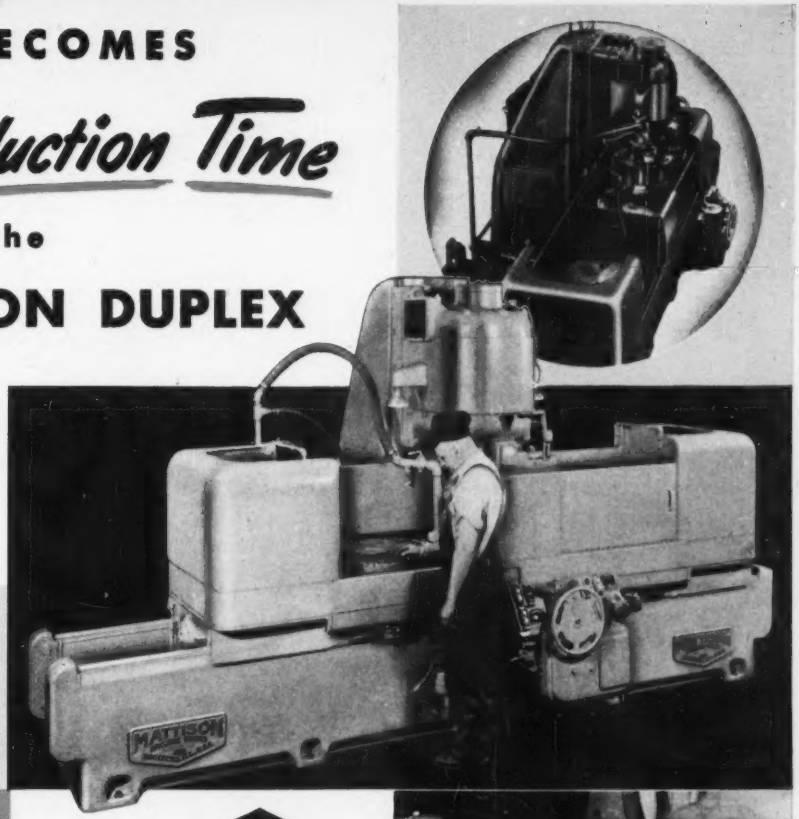
with the

NEW MATTISON DUPLEX

Take a look at **THIS**

~~2 Operators~~
~~2 Standard Grinders~~
~~500 Pieces~~

1 Operator
1 Mattison Duplex
500 Pieces





● That's what happened at The Ingersoll Milling Machine Co., where modern shop equipment is playing an important part in meeting greatly increased requirements for Ingersoll milling cutter blades.

They say "The pieces being ground in these pictures are Maxel steel shanks for carbide-tipped milling cutter blades.

On these particular blade shanks, .050 stock is removed on the Mattison Duplex. A wide variety of blades and shanks are ground on this machine, with stock removal ranging from .020 to .200.

The two Mattison Duplex machines which replaced three single-table standard type grinders are doing more work than the three replaced machines. By placing a single ring of blades around the outside of the 30″ diameter chuck, the operator is able to maintain continuous grinding. If more blades were put on the table at one time, the blades on the other table would be finished before he was ready to unload them.

The time saving in rough grinding these blades on the new Duplex machines is 50 per cent, compared with the old machines. In other words, 500 blades can be produced in half the time formerly required. Greater power and faster action account for some of this difference.

The new Mattison Duplex Grinder is really two machines in one, being equipped with two rotary tables or chucks instead of one. On many classes of work, one operator with this machine can turn out as much work as was formerly done by two machines and two operators. See example to the left. Downtime is practically eliminated.

An analysis of your grinding work will very likely disclose many jobs that could be very profitably handled on a Mattison Duplex. For further information write for a free copy of 145-3RM our new circular on this machine.

MATTISON MACHINE WORKS

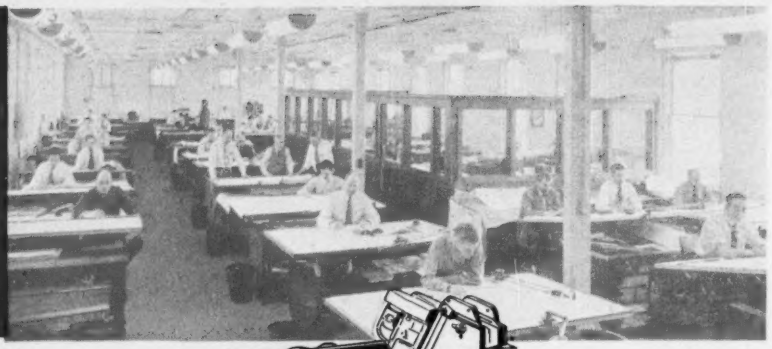
ROCKFORD • ILLINOIS



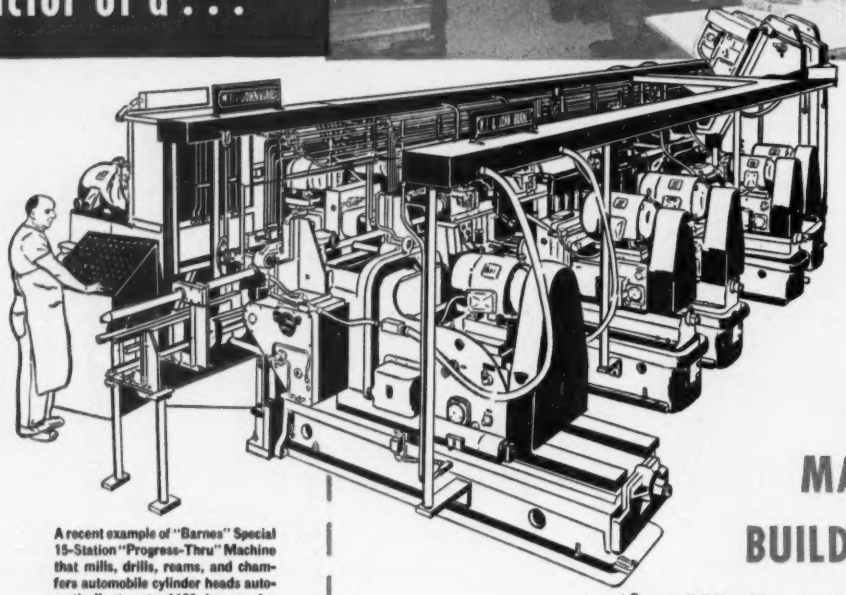
MADE IN

ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD ILLINOIS, U.S.A.

COORDINATED DESIGN and ENGINEERING important creative factor of a . . .



Partial view of Special Machine Engineering Department at Barnes.



A recent example of "Barnes" Special 15-Station "Progress-Thru" Machine that mills, drills, reams, and chamfers automobile cylinder heads automatically at a rate of 120 pieces per hr.

6-POINT MACHINE TOOL BUILDING SERVICE by W. F. & JOHN BARNES

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES . . .

1. **SPECIALIZED MANUFACTURING FACILITIES** — 75 year background, large well equipped plant efficiently tooled to produce high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT** — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL GAUGES, FIXTURES, TOOLS** — designed for each individual machining problem, assure accuracy of operations at high production speeds.
4. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING** — as briefly outlined.

Group Planning Saves Time and Trouble

The creative and engineering skills of Barnes people today encompass a much broader field of industrial activity than ever before in the company's 75 year history. Thoroughly experienced mechanical, hydraulic, electrical, process, tool and fixture engineers work together toward a common goal. As a result you get the benefit of a coordinated effort that saves time and trouble. Interchange of ideas insures constant progress in developing new and better methods for increasing productivity and lowering costs.

Undivided Responsibility Improves Results

In addition, because all planning, engineering, and manufacturing efforts at Barnes are closely coordinated, you get a complete machine tool building service all from one convenient, dependable source. Experience gained over the years enables Barnes Engineers to help you solve complex machining and production problems quickly. When your present or future machining needs call for faster, more efficient methods, it will pay you to call on Barnes for recommendations. No obligation.

W. F. & JOHN BARNES

W. F. & JOHN BARNES COMPANY
310 S. WATER ST., ROCKFORD, ILLINOIS

Write for Free Data

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.



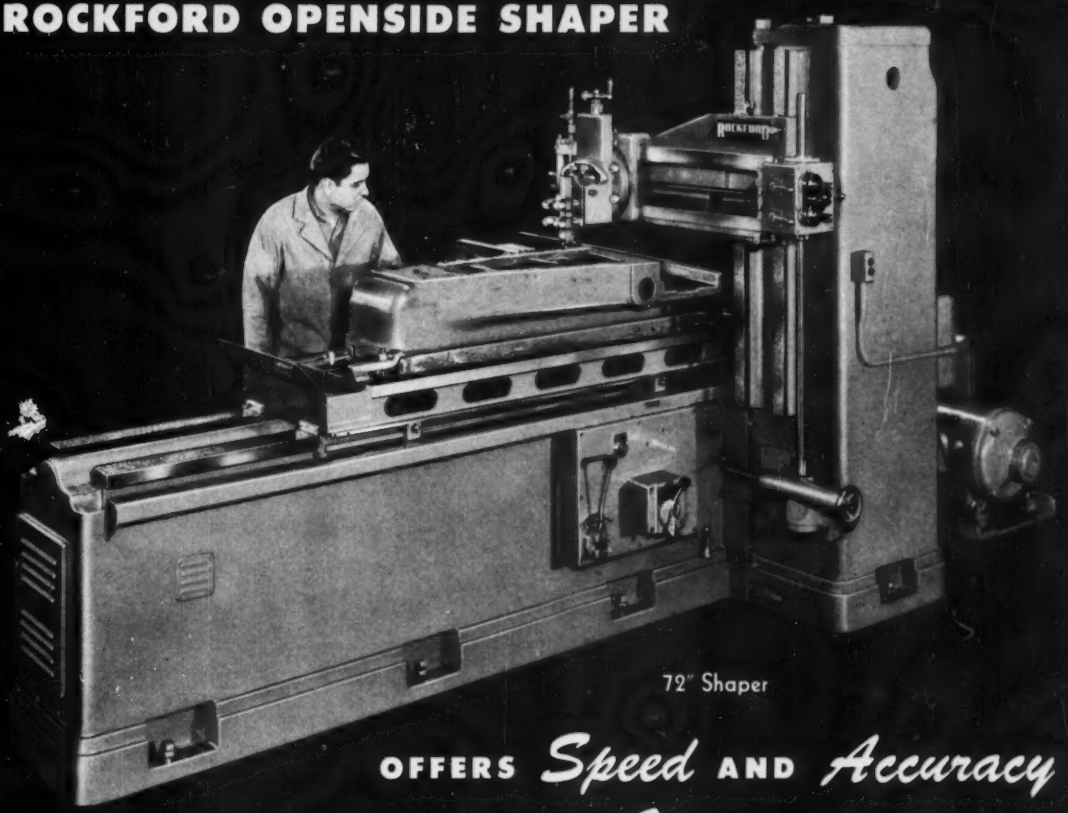
MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

MADE IN ROCKFORD... FOR ACCURATE, FAST METAL REMOVAL
ILLINOIS, U.S.A.



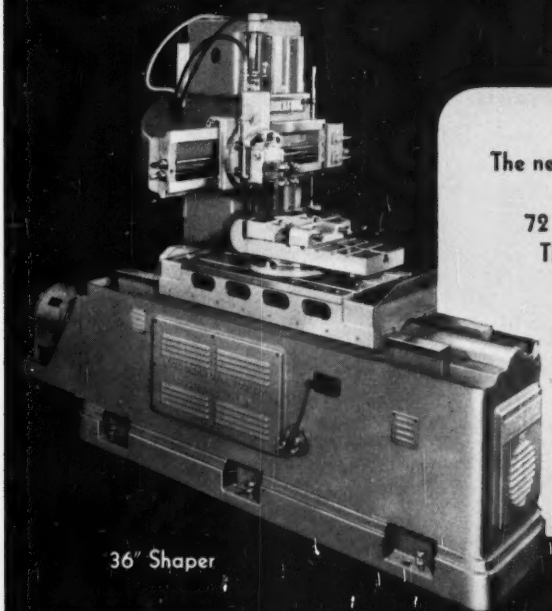
NEW.....

ROCKFORD OPENSIDE SHAPER



72" Shaper

OFFERS *Speed* AND *Accuracy* PLUS *Versatility*



36" Shaper

The new 72" Rockford Openside Shaper gives you best results on *all* shaper jobs — with stroke lengths up to 72 inches.

This "big brother" of the Rockford Openside Shaper family (36", 48", 60", 72") has all the superior features of companion models, *plus* increased capacity. It's the maximum in versatility — large-job capacity with no sacrifice in speed or accuracy. And It's *Hydraulic* . . . of course.

Before you invest, investigate the new 72" Rockford Openside.

Hy-Draulic

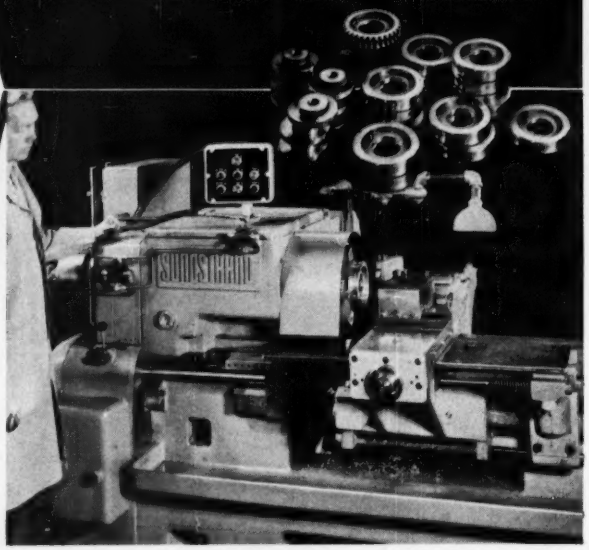
ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street • Rockford, Illinois



MADE IN
FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD
ILLINOIS, U.S.A.

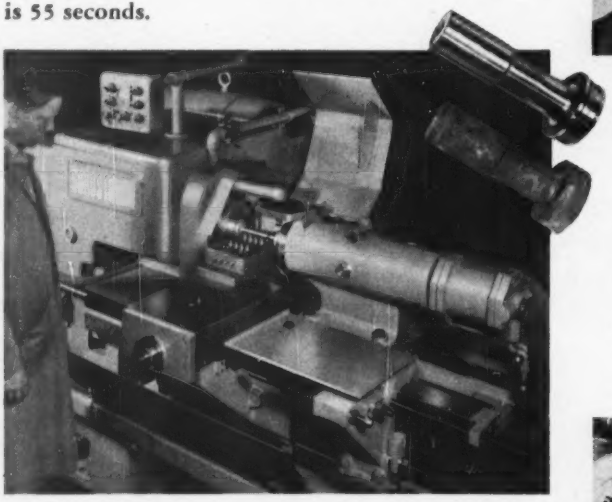
You'll Get Better Production With Sundstrand Automatic Lathes

...ON JOBS LIKE THESE



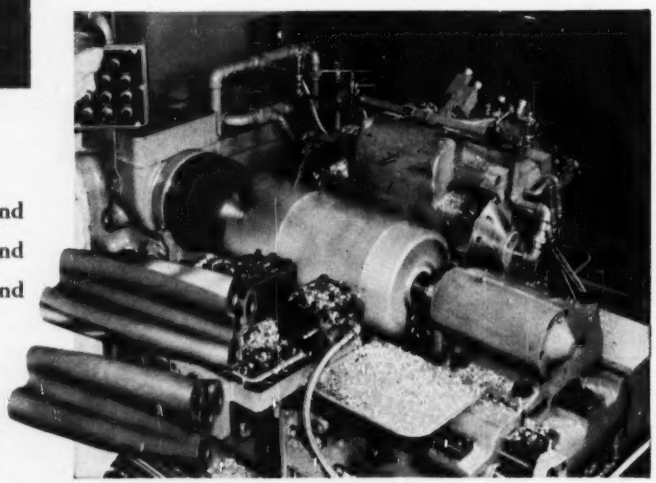
1 Small Lot Turning

This Model 8A Automatic Lathe machines a number of different sizes of bronze worm wheels and steel hubs in small lot sizes. Two operations are performed on each part. These include turning, facing, and boring. Floor to floor time of the largest worm wheel is 55 seconds.



2 Long Run Turning

Here is a 50 hp Model 12A with tooling set-up for production turning, facing, and chamfering of a shaft part. Multiple tools for faster stock removal and automatic cycling for fast easy operation has increased production of this part to 200 per hour—70% better than former methods.



3 Special Turning

Application of a special two position double end cross feeding facing slide, special front slide, and tail stock locator makes it possible for this Sunstrand Automatic Lathe to rough and finish turn and rough and finish face both ends of aluminum blower rotors in one chucking of part.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

MADE IN

ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT

ILLINOIS, U.S.A.



Machinery, September, 1952

SOME OF THE DESIGN FEATURES THAT MAKE THIS PRODUCTION POSSIBLE

These are only 3 of the 8000 or more users of Sundstrand Automatic Lathes. These users have always found Sundstrands a profitable investment and many have changed from old to new Sundstrand Automatic Lathes in order to get even higher productivity as a result of design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you increase production.

Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 10 HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 80 to 2400 RPM	30 to 900 RPM 60 to 1800 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60"	24, 36, 48 & 60"	36, 60 & 84"

FREE ADDITIONAL DATA

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 623.



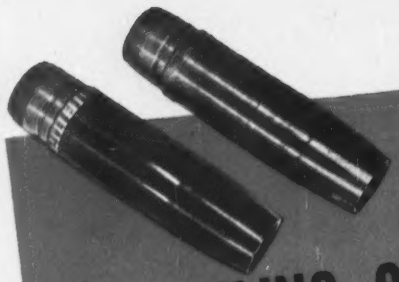
SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2530 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



MADE IN
CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD
ILLINOIS, U.S.A.



BROACHING RIFLING GROOVES ON RECOILLESS SHELLS the *American* way



Parts are manually loaded and automatically ejected for high production. Operator simply loads and starts the machine. Machine automatically reverses after down stroke.

The machine, fixture and broaches to broach the rifling grooves on recoilless shells are all American-engineered — typical example of complete American engineering from start to finish.

The MACHINE — A special T-10-36 American 3-Way — designed for the push down broaching of the shells past stationary broaches. The machine is equipped with dual electrical controls and is also arranged to allow the broached shell to eject automatically out the right hand side of the machine.

The FIXTURE — American engineers designed the lead bar attachment with driving lugs which contact the shell during the push down operation causing the shell to rotate during the broaching stroke.

The BROACHES — Individual cutters mounted in a pot incorporating the proper broach design to provide a free cutting operation as the shell is pushed through. These individual cutters can be easily removed for resharpening and replacement.

You can benefit from the American-Way when you want high production at low unit cost. Send a part print or sample for the recommendations of the company that *engineers and builds all three*—broaching machines, broaches and broaching fixtures. Write today. Address Dept. M.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

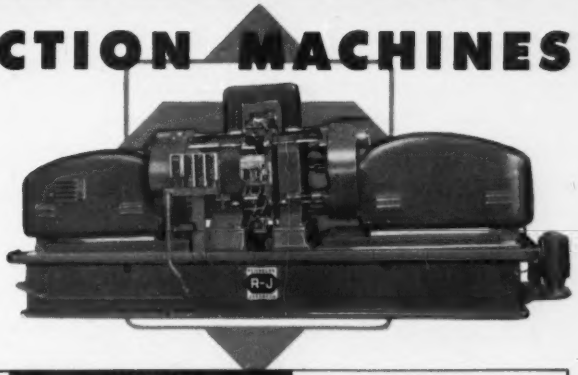
MADE IN
ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U.S.A.



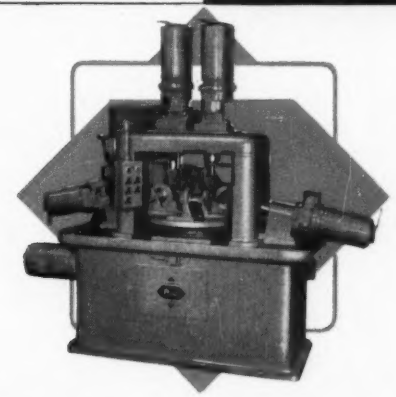
Rehnberg-Jacobson

SPECIAL PRODUCTION MACHINES

These are our Representatives



ST. PAUL Anderson Machine Tool Co. 2645 University Ave. St. Paul, Minn.	**INDIANAPOLIS** E. A. Kinsey Co. 725 N. Capitol Ave. Indianapolis 4, Ind.	**CLEVELAND** Wm. K. Stamets Co. 410 Leader Bldg. Cleveland 14, Ohio	**CINCINNATI** Frank S. Ranz Co. Federal Reserve Bank Bldg. Cincinnati 2, Ohio
KENMORE Geo. W. Brunton & Son 2315 Elmwood Ave. Kenmore, N. Y.	**TOLEDO** Klatt & Co. 329 20th St. Toledo 2, Ohio	**PITTSBURGH** Wm. K. Stamets Co. Jenkins Arcade Bldg. Pittsburgh, Pa.	**NEW ORLEANS** Oliver H. Van Horn Co., Inc. 1742 St. Charles Ave. New Orleans 1, La.
ROCHESTER Geo. W. Brunton & Son 703 Temple Bldg. Rochester 4, N. Y.	**SAN GABRIEL** Multi-Drill Equipment & Supply Co. P. O. Box 222 San Gabriel, Calif.	**SEATTLE** Star Machinery Co. 1741 First Ave. Seattle 4, Wash.	**BATON ROUGE** Oliver H. Van Horn Co., Inc. 1200 Neosho St. Baton Rouge, La.
DETROIT Walter F. Cahill Co. 17141 James Couzens Highway Detroit 35, Mich.	**TORONTO** J. H. Ryder Machinery Co., Ltd. 1130 Bay St. Toronto 1, Ontario	**PHILADELPHIA** Vandyck Churchill Co. 1321 Arch St. Philadelphia 7, Pa.	**SHREVEPORT** Oliver H. Van Horn Co., Inc. Spring & Fannin Sts. Shreveport, La.
NEW YORK Harrington Wilson Brown Co. 405 Lexington Ave. New York 17, N. Y.	**WINDSOR** J. H. Ryder Machinery Co., Ltd. 1165 Tecumseh Blvd., East Windsor, Ontario	**SYRACUSE** K. C. Randall Machinery Co. P. O. Box 1012 Syracuse, N. Y.	**CHICAGO** Neff, Kohlbusch & Bissell 5700 West North Ave. Chicago 39, Ill.
WEST HARTFORD Harrington Machinery, Inc., 62 LaSalle Road West Hartford, Conn.	**HAMILTON** J. H. Ryder Machinery Co., Ltd. 272 Kenilworth Ave., N. Hamilton, Ontario	**HOUSTON** Preston Machine Tool Sales Co. P. O. Box 1624 3016 Canal St. Houston 1, Texas	**MILWAUKEE** Neff, Kohlbusch & Bissell 610 W. Michigan St. Milwaukee 3, Wis.
			ROCK ISLAND Neff, Kohlbusch & Bissell 318 Illinois Oil Bldg. Rock Island, Ill.



These are our products...

Rehnberg-Jacobson machine tools are specially designed and built to provide greater production at lower cost, as required by the conditions of the individual situation. They usually consist of ingenious arrangements of R-J Drill, Tap, and Index Units on suitable simple structures, with special tooling and fixtures to suit the circumstances. R-J Drill, Tap, and Index Units are also sold separately for installation by the purchaser on his own machines. Be sure to call in your R-J representative for skilled assistance toward the development of ***production improvements to suit your needs.***

REHNBERG-JACOBSON MFG COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

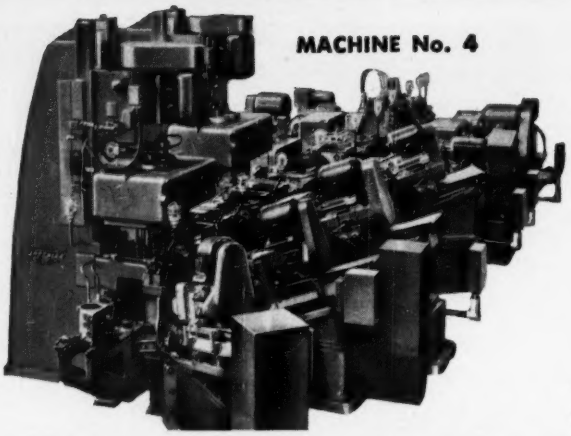


MADE IN

YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCKFORD ILLINOIS, U.S.A.

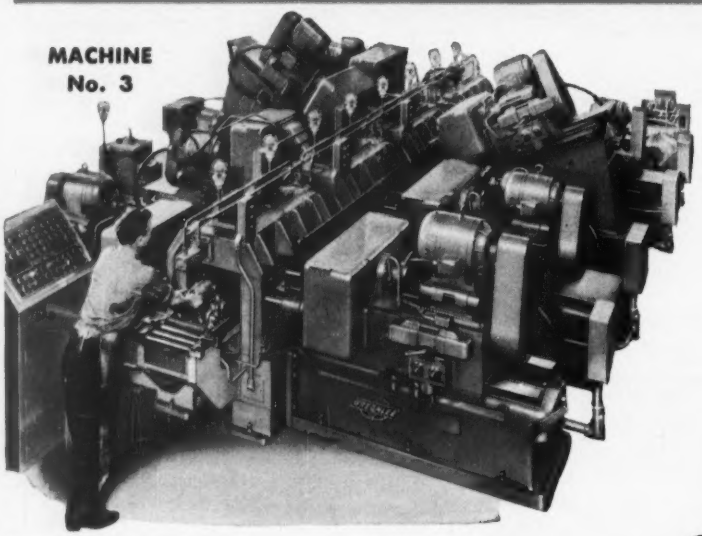
208 OPERATIONS IN 44.3 SECONDS

These recently-built Greenlee transfer machines mill, bore, drill, ream, and tap transmission cases for a well-known automobile. A total of 183 tools complete 208 operations in an automatic cycle time of 44.3 seconds. Features include face and end-milling heads, turnover and chip-cleanout stations, and indicator lights for tool changing. Self-contained hydraulic units conform to JIC standards for easy maintenance. These outstanding machines are among the newest built by Greenlee — a pioneer in progressive transfer-machine principles.



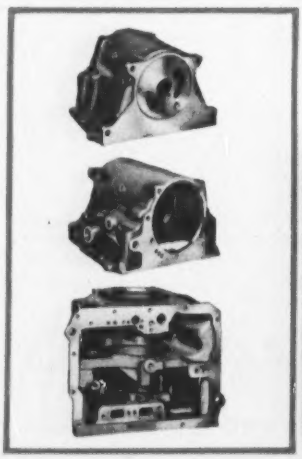
MACHINE No. 4

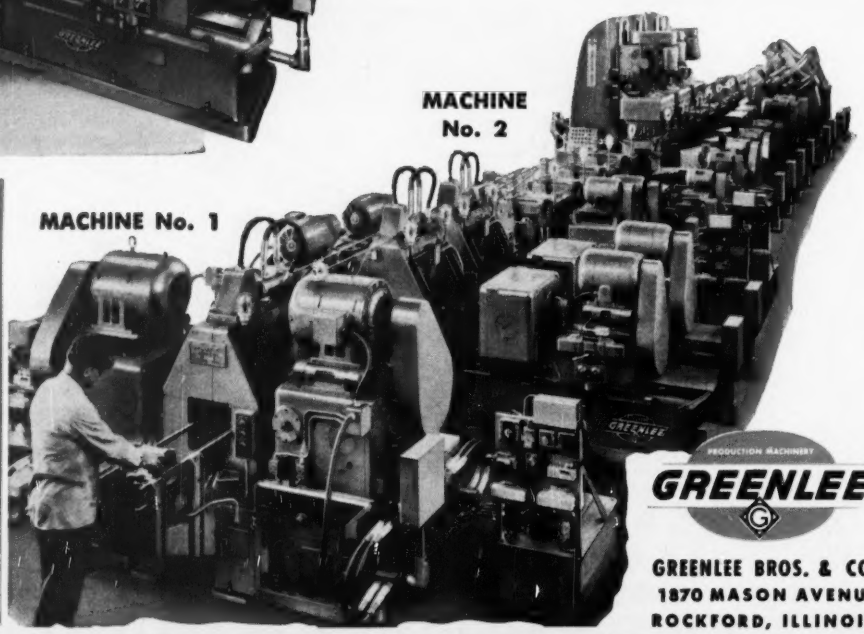
GREENLEE



MACHINE No. 3

TRANSFER MACHINES
PROCESS
AUTOMATIC
TRANSMISSION CASES
AT THE PRODUCTION RATE OF
65 CASES PER HOUR





MACHINE No. 2

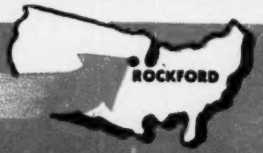
MACHINE No. 1

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1870 MASON AVENUE
ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



INGERSOLL

Inserted Blade Milling and Boring Tools



THE RIGHT CUTTERS
for Maximum Production

The cutters illustrated here are only a few of the many types we build.

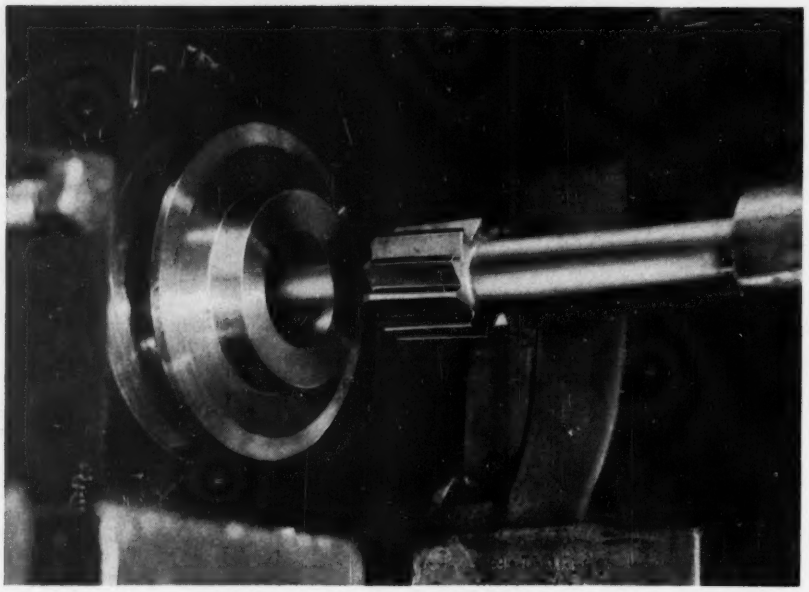
Whatever your requirements may be, Ingersoll's 65 years of experience as builders and users of machines and cutters is available to you.

We will be glad to have one of our cutter engineers look over your work and make recommendations for increasing your production. Address inquiries to:

THE INGERSOLL MILLING MACHINE COMPANY
2400 Douglas St., Rockford, Ill.



MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

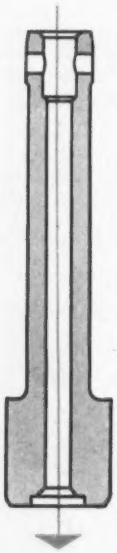


REAM FINE FINISHES

ON SCREW MACHINES AND TURRET LATHES

20-25 micro-inch finish

Reamed finishes which were never considered possible are now obtained on production jobs with Barber-Colman Oil-Feed Reamers. On this job, 1000 pieces were reamed to a surface finish of 20-25 micro-inches before it was necessary to sharpen the reamer. The feed is 1.75″ per minute at 280 RPM, requiring 30 seconds to ream the 7/8″ length of cut. The material is AISI C 1137 steel. Finishes like this can be obtained in regular production with Barber-Colman Oil Feed Reamers.



oil feed

An outstanding feature of these oil-feed reamers is that the oil feeds through the body of the reamer to flush the chips away from the cutting area. Other types of reamers tend to pack the chips in front of the reamer, increasing the chance for "pick up" which often ruins the finish and shortens the life of the tool. As the oil hits the end of the hole, it is forced back between the flutes, carrying the chips with it. Another aid to extending tool life is that the oil reaches the cutting area on jobs which could not otherwise effectively employ a free flow of coolant.

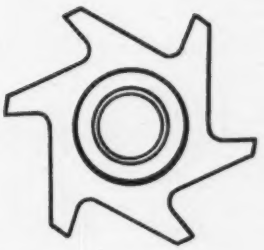
DESIGNERS OF STANDARD AND SPECIAL

MADE IN
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS
ILLINOIS, U.S.A.



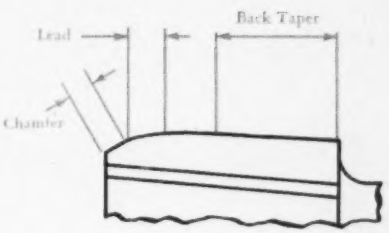
Machinery, September, 1952

irregularly-spaced flutes



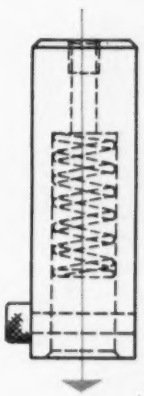
Irregular spacing is a standard feature of all Barber-Colman Oil-Feed Reamers. This type of spacing provides a smooth cutting action and fine finish and prevents the reamer from forming "welts". Thus, the design of the spacing in conjunction with the oil-feed feature allows these reamers to produce surface finishes which formerly required a secondary finishing operation. To aid in checking the reamer diameter, the flutes are spaced diametrically opposite each other so that they can be inspected with a micrometer.

cam-controlled sharpening



The profile form on the reamer flutes is important in obtaining the best finish and tool life. Following a 30° chamfer, the lead is blended into a radius and followed by a straight portion which irons out the feed marks. This combination produces exceptionally fine finishes. Also, through the use of the Barber-Colman system of sharpening, a theoretically sharp cutting edge is produced rather than a cylindrical land. The Barber-Colman system is cam-controlled so that each reamer is sharpened with exactly the same profile. These are features which are available in no other type of reamer.

self-centering floats



These spring-type floats hold the reamer firmly, eliminating any sagging. Its simple design, consisting of only the holder, drive pin and spring, makes it easy to operate and maintain. An opening through the center of the float allows the oil to reach the reamer. Only two floats are required to cover the complete range of sizes, although a float of extra length is available for the larger sizes. These reamers are available for diameters of .344″ through 1.380″.

Ask for new bulletin listing specifications and prices or call your nearest Barber-Colman representative.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 120 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

METAL CUTTING TOOLS SINCE 1908



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YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCKFORD
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☆ Faster Checking...

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Built with Stationary or Traveling Ram . . . capacities up to 10, 25, and 50 tons . . . so sensitive and accurate that a shaft may be bent .001". Pressure gauge, indicating ram loading . . . adjustable dial indicator shows amount of shaft run-out in preloaded, fully loaded, and unloaded positions.

Flexible, sensitive control by rotary control valve operated by hand lever. An infinite range of loading up to capacity as lever is moved from 0 to maximum displacement. Push button control of hydraulic unit. Work table, 60" or 108" long. Available attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To increase production speed, an adjustable stop collar limits the stroke of the ram.





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For balancing, straightening and truing operations. No leveling or centering required. Simply place part to be tested on the four chilled iron discs rotating on supersensitive ball bearings. Made in five sizes . . . 20" to 96" swing.

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Has a "natural hand control" . . . as easy to use as a hand scraper. Left hand serves as guide to the blade . . . right hand controls the stroke. Pressure of left hand controls depth of cut, but forward cut requires no back-breaking labor. A slight forward pressure on cylinder with right hand starts swift, smooth forward stroke which can be regulated from nothing to 3½ feet . . . 60 feet per minute, reverse speed 90 feet per minute. Operator can work at a steady rate without tiring as ¼ h.p. motor does heavy cutting. With this machine one man can do the work of several. The Anderson Power Scraper, mounted on an elevating truck, is easily moved to any location. Machine may be plugged into electric lamp socket and be ready for use. In scraper housing directly across from motor is a scraper blade grinder . . . a convenient, speedy means of resharpening scraper blades without leaving machine.

Send for Bulletin No. 9-6

ANDERSON BROS. MFG. CO., ROCKFORD, ILLINOIS

MADE IN

ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS

ILLINOIS, U.S.A.



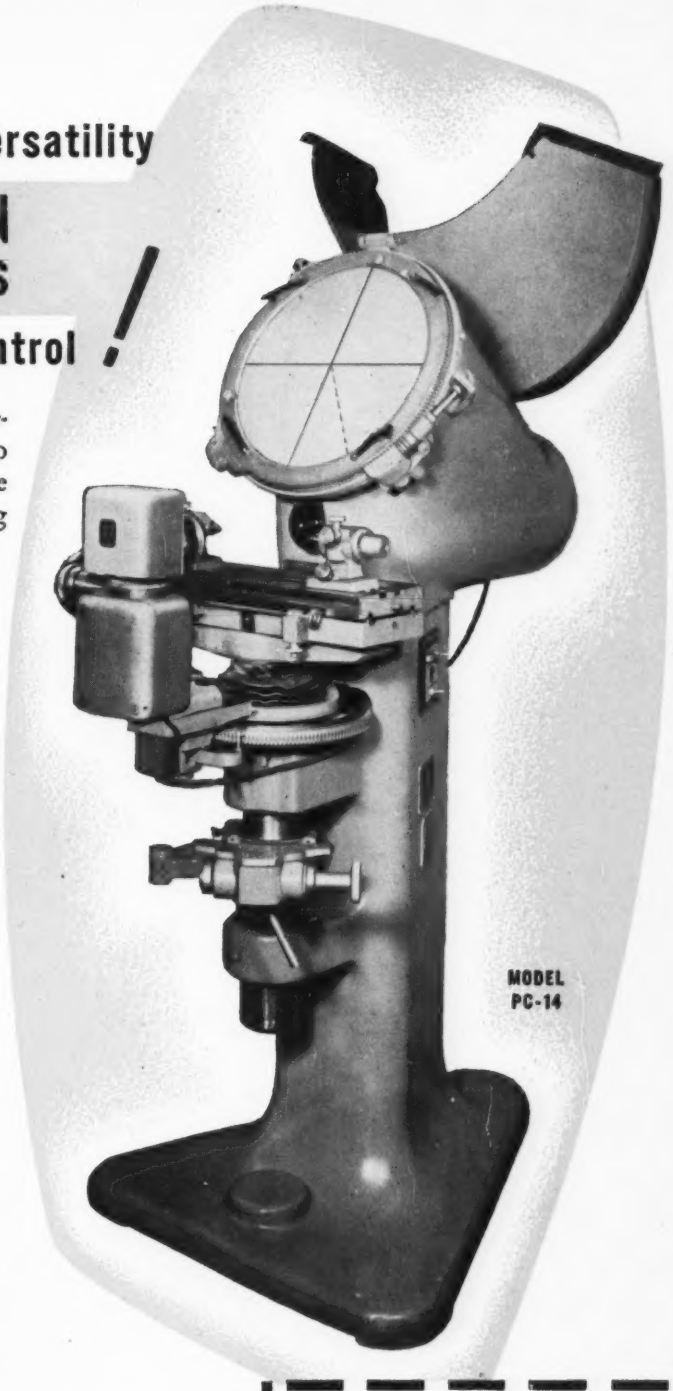
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Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
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- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



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JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Machine Tool Craftsmen Since 1835
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PRESENTING

a new approach in single spindle machines

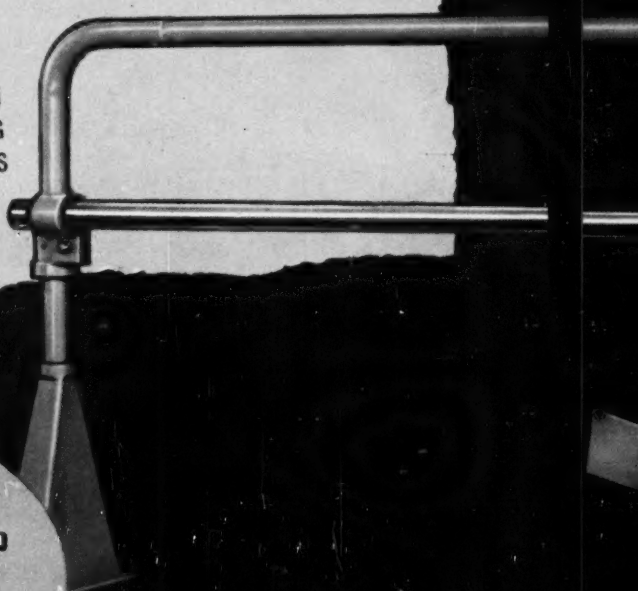
Here is a machine of remarkable mechanical simplicity and simplicity of operation. In addition to the many features guaranteeing quick set-up, Model 126 has the power, performance, accuracy, and rigidity for long as well as short runs. Let our sales engineer prove to you the advantages of these features:

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2. No pick-off gears to change in selecting speeds and feeds.
3. Quickly adjustable standard wedge cams for cross slide feeds.
4. Automatic cycle completely controlled from central drum.
5. Pre-selected, automatically changed feeds for each of five turret stations.
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7. Coolant system and chip pan outside machine base.
8. Specifically designed for use of water coolant.

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Machines for making progress . . .

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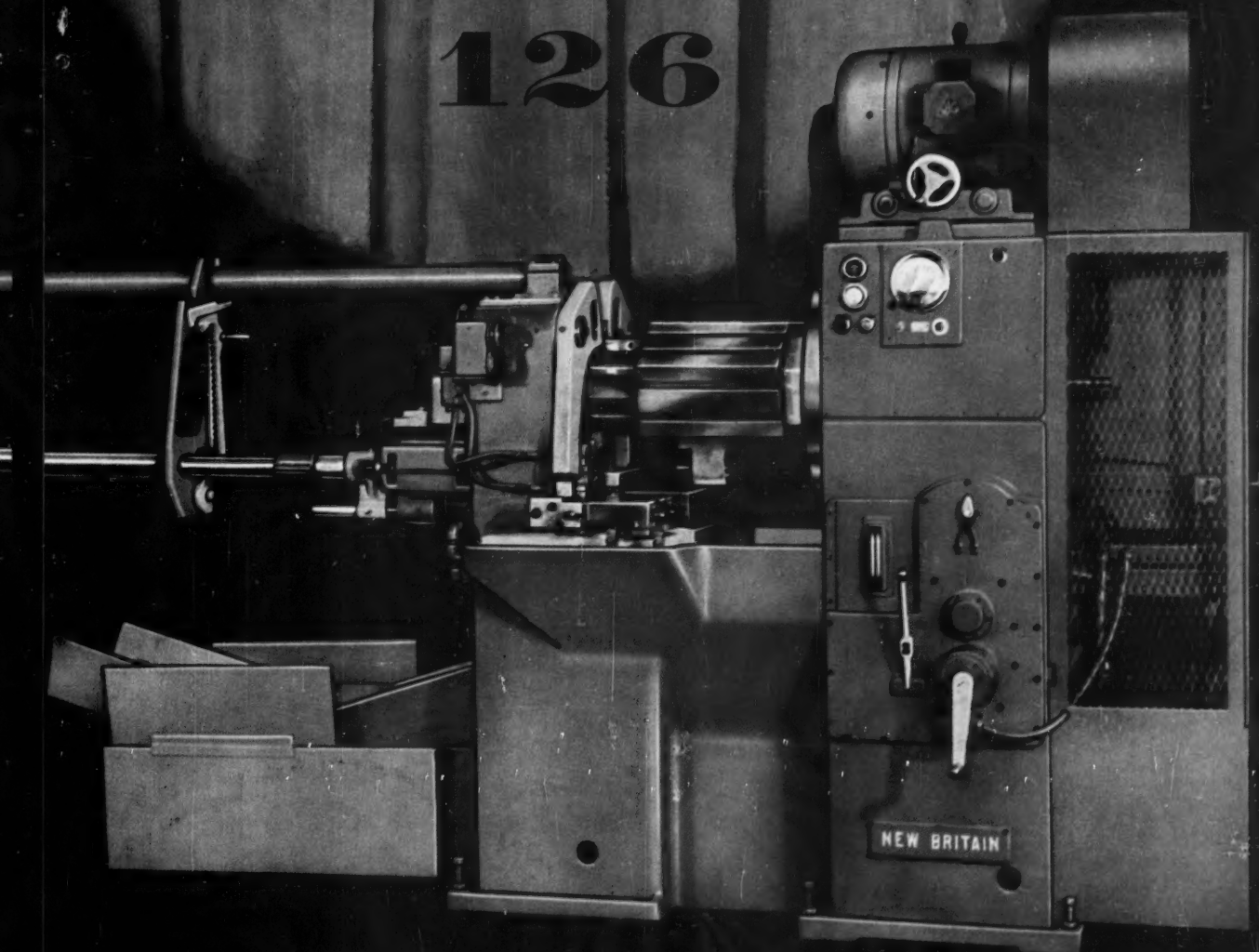
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NEW BRITAIN

Automatics

THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
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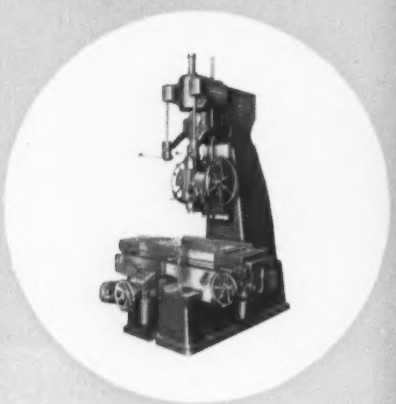
The NEW NEW BRITAIN MODEL 126



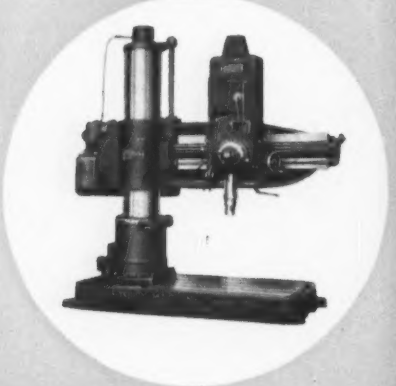
Sensitive Radial Table is universally adjustable, arm rotates at a constant height, and controls remain within convenient reach. One piece column, 3 and 4 ft. arms. Drills up to 1½ ″.



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Economax Hydraulic Radial Fosdick was *first* to use hydraulics in a radial for smooth, positive action, convenient operation. Thirty-six spindle speeds, eighteen feeds. 5 to 8 ft. arms, 11 to 19 inch columns.



these Fosdick drills will give you efficient hole production

Write today for catalog FLM

THE FOSDICK MACHINE TOOL CO.

FOSDICK

Cincinnati 23, Ohio



Jig Borer For top quality positioning and boring of precision holes at low cost. Table sizes: 18″ x 36″ and 22″ x 44″. Table to spindle capacity, 27″, 3 hp motor.



Multiple Sensitive For economical production of small drilled parts. 1 to 6 spindles in either six or nine speeds from as low as 55 r.p.m. to as high as 3600 r.p.m., four power feeds.



Upright Two sizes, 25″, 30″ with either round or box columns. Twelve spindle speeds from 60 to 1500 r.p.m., nine power feeds from .005″ to .043″ per rev.

BULLARD

MANUFACTURERS OF MACHINE TOOLS



Santiago Lake, California, and Scenic Road construction — Kaufman & Fabry Photo

The Invisible Background of Industrial Progress

Free America — "the country of roads" — High speed highways — State highways, some exclusively for pleasure car travel and Municipal roads — all contribute to the expansion of interstate, intercoastal, municipal and rural development. Equally important in our road systems are the many scenic roadways constructed for tourist and vacation travel. . . . Such projects are costly, but with more than fifty-two million passenger cars, trucks and busses, an increase of over 3.5 million in one year, they are essential to greater economic transportation, not only giving us a Freedom known only to the American Way of Life but also facilitating the movement of forces if needed for defense. . . .

In the Invisible Background of Industrial Progress, are the manufacturers of ★ *Modern Machine Tools* and all other equipment which make such projects possible. Tractors, grading equipment, hoists, sand mixers and hundreds of other pieces of construction machinery depend upon Machine Tools for their manufacture. Bullard is indeed proud of their part in the over-all picture of a country of Free People.

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BRIDGEPORT 2
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★ *For greater manufacturing economy REFER to next page*

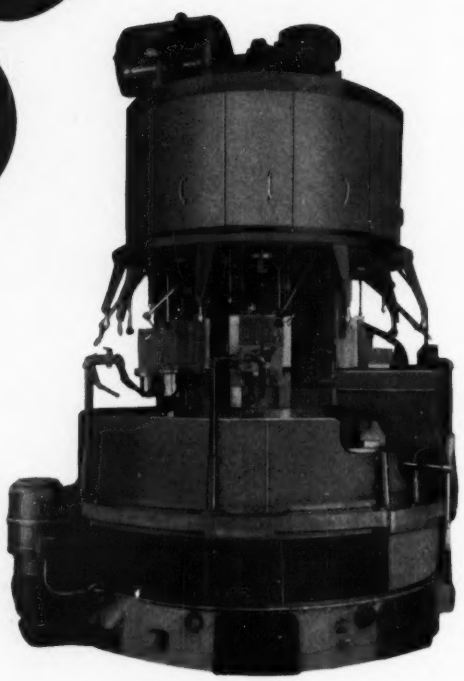
BULLARD MACHINE TOOLS

FOR GREATER MANUFACTURING ECONOMY



Operations on Tractor Front Wheel Knuckle Housing

The Mult-Au-Matic method has a basic time element for Manufacturing Economy. The time to produce a finished piece of work is equal to the time for the longest operation plus a few seconds for indexing. Mult-Au-Matics are considered as Key Units for repetitive machining of work where Accuracy and Fast Economical Production are the requirements.



Mult-Au-Matic work is not confined to any one field of industry but extends over a wide range of products made from varying types of materials. Today, under the defense program, these machines are in extensive use because of their high productive capacity, their consistent repetitive accuracy and their reliability with minimum "Down-Time".

Whether it is defense work or normal peace-time production the Mult-Au-Matics provide a low unit cost manufacturing method.

There is a Mult-Au-Matic for nearly any size job up to 34 inches in diameter.

For Manufacturing Economy use Mult-Au-Matics. Built in 8-, 12-, 16-, and 34-inch sizes with 4, 6, 8, 12, or 16 spindles according to the specific model.

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are worth knowing about



WHAT metal is best for bearings? For diaphragms? For *any* tough production job that requires a metal of superior qualities? Chase Phosphor Bronzes may be the answer.

These tin bronzes are superior to many other metals for a wide variety of functions. Some Chase Phosphor Bronzes are ideal for fuse clips, spring contacts, bellows, lock washers. Others are suited for bearings, bushings, gears, pinions, screw machine parts. They are made in Rod, Strip or Wire.

Chase Phosphor Bronzes... like all Chase metals... are carefully controlled as to quality to provide a high standard of surface finish and excellent internal characteristics. Fill in the coupon below and we'll send you the free Chase folder.



FREE Folder gives tables of Chase Phosphor Bronze properties (hardness, tensile, fabrication, physical) as well as uses and forms.

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MAGNESIUM

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Yes, putting a protective finish on magnesium can be done easily, economically and with satisfactory results. The procedures used do not differ greatly from those employed with other metals. After thorough cleaning, a chemical finish is applied and this is followed by the desired paint coating. The important considerations are the proper choice of chemical treatment and paint materials.

Through the efforts of Dow and paint manufacturers, thousands of paint test panels have been exposed to determine the best paint materials and the most efficient complete paint systems. As a result, paint systems are available which meet normal requirements and combine adequate protection with attractive decorative characteristics. Detailed recommendations are available for conditions under which magnesium is used, in service ranging from baked enamel systems for office machines to weather-resisting, air-dried primers and finishes for truck bodies and trailers.

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NORGE ENGINEERS SAY...

STRESSPROOF® WORKS WHERE OTHER STEELS FAIL



STRESSPROOF was selected for this transmission pinion gear for the Norge washing machine—made by NORGE Division of Borg-Warner Corporation.

● This washing machine pinion must run for years without appreciable wear. After extensive field tests, Norge engineers found that STRESSPROOF works where other steels fail. Even heat-treated alloy, at double the cost per part, does not equal STRESSPROOF.

Then too, STRESSPROOF is used as machined. No heat treating means no distortion, with the consequent noisy operation of the washing machine. The pinions made of STRESSPROOF are clean and free of scale and require no clean-up work. They are ready for assembly as they come off the machines.

STRESSPROOF makes a better part at lower cost.

Wear resistance is only one of the four in-the-bar qualities that makes STRESSPROOF the choice for thousands of parts. *High strength*, double that of ordinary cold-finished shafting; *Machinability*, fully 50% better than heat-treated alloys of the same strength; and *Minimum warpage* in machining—are three other attributes of this unique steel.

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We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

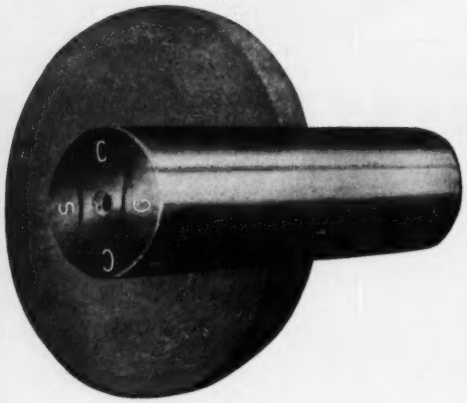


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

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CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 **INCORPORATED 1892**



Easier installation with "Quikupl" made possible a reduction of 40 to 50% in time and labor when this line was installed in Feb. 1951. Since then "Quikupl" has been completely tested to complete satisfaction. Place: Precision Film Laboratories, Inc. New York.

"QUIKUPL"®

STAINLESS STEEL FITTINGS

Now . . . you can join tubing or pipe without threading, flaring, sweat-soldering, brazing or welding. Simply use "Quikupl" . . . the *completely new . . . completely tested* stainless steel fitting.

"Quikupl" cuts labor and installation time. Lines already installed show time and labor can be reduced 40 to 50%—or more. Tubing or pipe is simply cut to length, deburred and inserted into the fitting. Tightening a small screw completes the coupling. A resilient sealing ring . . . nontoxic to foods, and resistant to most chemicals . . . provides initial squeeze fit between fitting and tube or pipe. The higher the pressure, the better the sealing effect.

"Quikupl" is a money saver. You can use Schedule 5, the lightest pipe made—or tubing with even a lighter wall. You pay less per foot because you buy only the wall thickness needed to do the job.

"Quikupl" couplings, tees, adapters and elbows (45° and 90°) are available from Frasse warehouse stock in Types 304 and 316 Stainless Steel—tube and pipe sizes range from 1" O.D. to 4" O.D.

Facts about "Quikupl" fittings and how you can save with them are outlined in Frasse Engineering Memorandum #7. Send for your copy today.

Call FRASSE 1st FOR STAINLESS STEEL

Bars • Sheets • Strip • Plates • Wire
Tubing • Pipe • Valves • Fittings

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Gentlemen: Please send me your Engineering Memorandum #7 containing complete facts about "Quikupl" stainless steel fittings.

Name_____ Title_____

Firm_____

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It will pay you to review

Production Increased 89.7%



Grade: MX
Cold drawn size: ⅝" Rd.
Part Name: Camera coil case for flash gun
Machine: New Britain
Operations: Spot and form, drill 27/64", drill 37/64", ream and shave, thread, cut-off
Cutting Media: HS Steel and Allube Nu-Sol No. 2

Comparative production:

Grade	SFM	Seconds per part	Parts per Hour	Production Increase
B-1113	110 Turn 35 thread	11.3	319	.....
MX	230 Turn 70 thread	6.0	605	89.7%

Production could have been improved except threading operation governed production.
(Material cold drawn by Bliss & Laughlin, Inc.)

Production Increased 41%



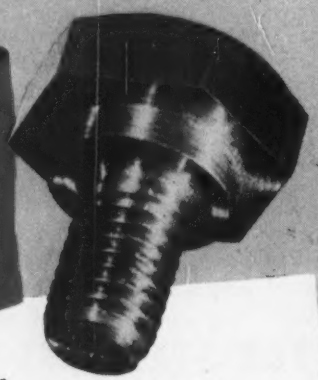
Grade: MX
Cold drawn size: ½" diameter
Part Name: Hub
Machine: Brown & Sharpe No. OG
Operations: Center drill, drill, ream, front slide form, back slides cut-off

Comparative Production:

Grade	SFM	Seconds per part	Parts per hour	Production increase	Tool life hours
B-1113	225	12	300	....	Same for both
MX	298	8.5	423	41%	

(Material cold drawn by Bliss & Laughlin, Inc.)

Production Increased 33.5%



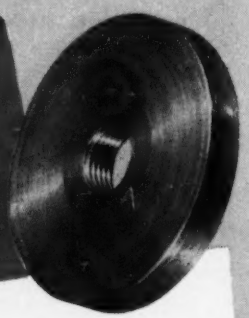
Grade: MX
Cold drawn size: 1⅛" Hexagon
Part Name: Bearing stud bolt
Machine: Model 61, 1⅜" New Britain, 6-spindle
Operations: Rough and breakdown knee turner, finish knee turning, face off, finish form, hollow mill, thread, breakdown cut-off, cutting off
Cutting Media: Shell Fenella #921 (Sulphurized)

Comparative Production:

Grade	SFM	Seconds per part	Parts per hour	Production Increase	Tool life Parts	Tool life Increase
B-1113	200	20	179	.....	716	.....
MX	250	15	239	33.5%	1912	167%

All MX parts have superior finish. Tools ground only half as often with MX
(Material cold drawn by Bliss & Laughlin, Inc.)

Production Increased 27%



Grade: MX
Cold drawn size: 1⅜" Rd.
Part Name: Pulley
Machine: Brown & Sharpe, G-2
Operations: Center drill, recess and drill, tap ⅝", thread, form, face and cut-off. (Feeds increased with MX)
Cutting Medic: Socony Vacuum General Purpose oil, plus 3% sulphurized. Filtered and cooled to 50°.

Comparative production:

Grade	SFM	Seconds per part	Parts per hour	Production Increase
B-1113	245	35	103	....
MX	312	27.5	131	27%

Tool life with MX was equal or superior to B-1113. High quality finish maintained.
(Material cold drawn by Bliss & Laughlin, Inc.)

steel "specs" set up years ago ...now that costs can be cut with MX

today's freer-cutting screw stock!

THE old ways are not always the best ways. Now that U·S·S Free-Machining MX has been developed, the performance of those older specifications for screw machine stock, that you've continued to follow without question on repeat orders, should be carefully re-examined.

For with this new freer-cutting MX screw stock, your screw machine parts, no matter how intricate, can be turned out faster and with less tool wear than when produced with ordinary Bessemer screw stock.

These are facts. In hundreds of shops that have used MX in producing millions of parts of many different kinds, the story is always the same. MX has shown that it will boost hourly output, lengthen the interval between tool changes, will produce more accurate parts and improve part finish. In every instance where MX has been given a thorough trial, cost savings have been recorded.

These cost savings with MX have run as high as 42%—usually the figure runs around 10 to 15%. We feel safe in saying that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock—even though MX costs a fraction of a cent more per pound.

Switch to MX. Give it a thorough trial and watch your production go up and your costs go down.

U·S·S Free-Machining MX is being produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

NOW, when production is more important than ever—speed up the job with MX

USS

UNITED STATES STEEL COMPANY, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-406

UNITED STATES STEEL

NOW YOU CAN TOOL STEEL IN

New "GRAPH-MO HOLLOW-BAR" longer wear of Graph-Mo with the

HERE'S big news for makers of ring gages, dies and other ring-shaped tool steel parts! A new product—"Graph-Mo Hollow-Bar"—gives you all the advantages of Graph-Mo tool steel *plus* all the advantages of a hollow bar section.

With "Graph-Mo Hollow-Bar" you can eliminate drilling, make finish boring your first step. The hole is already there. You cut machining time, reduce scrap loss, get more parts per ton of steel!

And you get all the proven advantages of Graph-Mo—a special kind of tool steel that contains free graphite and diamond-hard carbides in its structure.

User reports show that Graph-Mo outwears other tool steels an average of three to one.

Tests prove it machines 30% faster than other tool steels.

It has minimum tendency to pick up, scuff or gall.

12-year tests prove it's the most stable tool steel made.

It gives uniform response to heat treatment.

All these advantages, plus the economy of the hollow bar section, make "Graph-Mo Hollow-Bar" the big news of the year for makers of ring-shaped tool steel parts.

"Graph-Mo Hollow-Bar" comes in sizes ranging from 4" to 16" O.D. with a variety of wall thicknesses. It is distributed through A. Milne and Company and Peninsular Steel Company. And it's available in the following cities: New York, Boston, New Britain, Philadelphia, Buffalo, Pittsburgh, Cleveland, Akron, Dayton, Toledo, Detroit, Grand Rapids, Indianapolis, Chicago and San Francisco.

ADVANTAGES OF GRAPH-MO

- Most stable tool steel made
- Outwears others 3 to 1
- Machines 30% faster
- Minimum tendency to pick up, scuff or gall
- Uniform response to heat treatment

PLUS

For full information on this money-saving new Timken steel product write, The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Specialists in fine alloy steels, graphitic tool steels and seamless tubing

GET GRAPH-MO® HOLLOW BARS!

combines the faster machining and economy of a hollow bar section

ADVANTAGES OF HOLLOW BARS

No drilling

Finish boring is first step

Less machining time

Less scrap loss

More parts per ton of steel

EQUALS

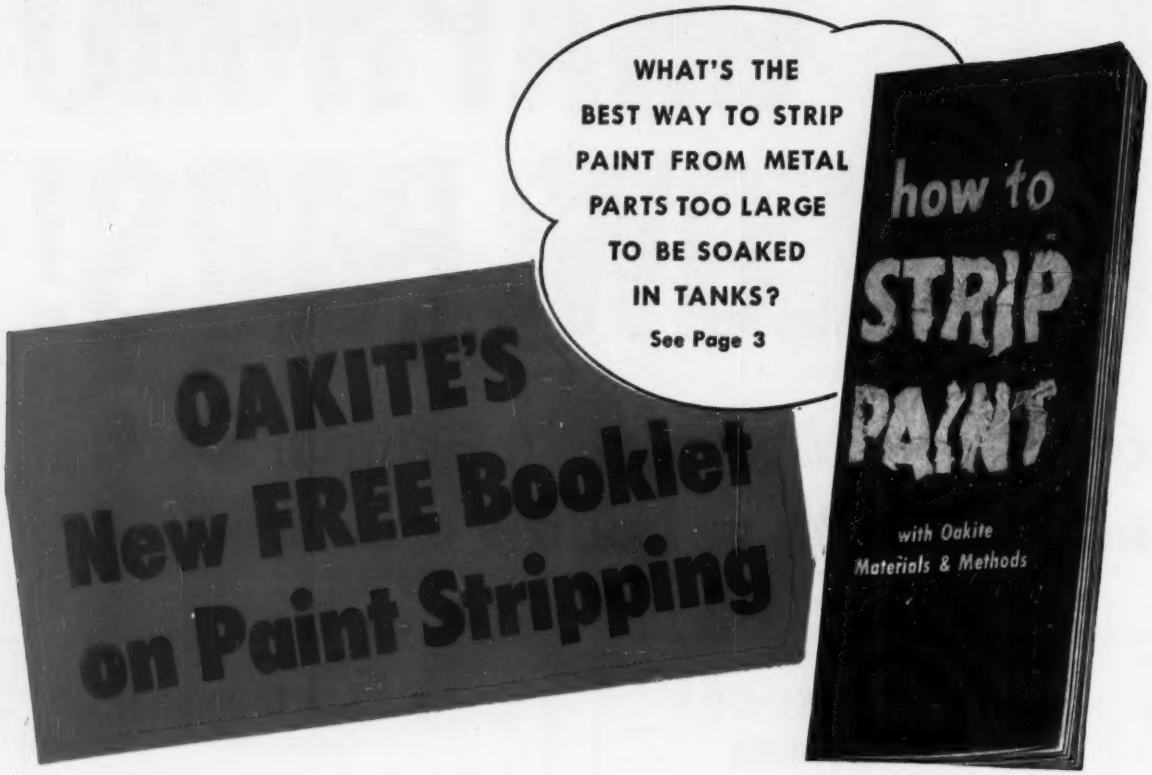
ADVANTAGES OF

"GRAPH-MO HOLLOW-BAR"

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



TIMKEN
Fine Alloy
STEEL



answers many questions that will lead you to better stripping procedures. You'll want to read more about:

What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.*

What is the best method when steam is not available? *See page 7.*

What is the cheapest way to strip metal parts in large volume? *See page 9.*

What are the best ways to prepare stripped surfaces for repainting? *See page 11.*

What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-based paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

FREE For a copy of "How to STRIP PAINT" write to Oakite Products, Inc., 19 Rector St., New York 6, N. Y. This well-illustrated booklet describes four money-saving ways to remove paint:

1. **Oakite Steam Gun Method**
2. **Oakite Hot Flow-On Method**
3. **Oakite Cold Spray Method**
4. **Oakite Tank Immersion Method**

OAKITE PRODUCTS, INC.
19 Rector St., New York 6, N. Y.

Send me a copy of your booklet *"How to STRIP PAINT"*

Also tell me (without obligation) about Oakite methods for the following jobs:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling
- ☐ Pre-paint treatment
- ☐ Steam-detergent cleaning
- ☐ Burnishing
- ☐ Rust prevention

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COMPANY_____

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SPECIALIZED INDUSTRIAL CLEANING

OAKITE

TRADE MARK REG. U. S. PAT. OFF.

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada



tool steel is our fair-haired boy!

We are definitely partial toward *our* tool steel. Especially since users have verified our opinion of them by making us the country's number one producer of fine tool steel.

Naturally, we intend to maintain this position. Therefore, Crucible research and development is forging ahead, supplying industry's need for new, improved tool steels . . . Crucible makes its long experience freely available to you through its metallurgical service . . . And Crucible provides you with prompt delivery of tool steel, from its completely stocked warehouses, conveniently near you.

SEND TODAY for the unique Crucible Tool Steel Selector—a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
Airdi® 150
Nu-Die V Die Casting Steel
CSM 2 Mold Steel
La Belle® Silicon #2
Atha Pneu

SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

Crucible Steel Company of America
Dept. M, Chrysler Building, New York 17, N. Y.
Name_____
Company_____ Title_____
Address_____ City_____ State_____

9" diameter, 3-colors

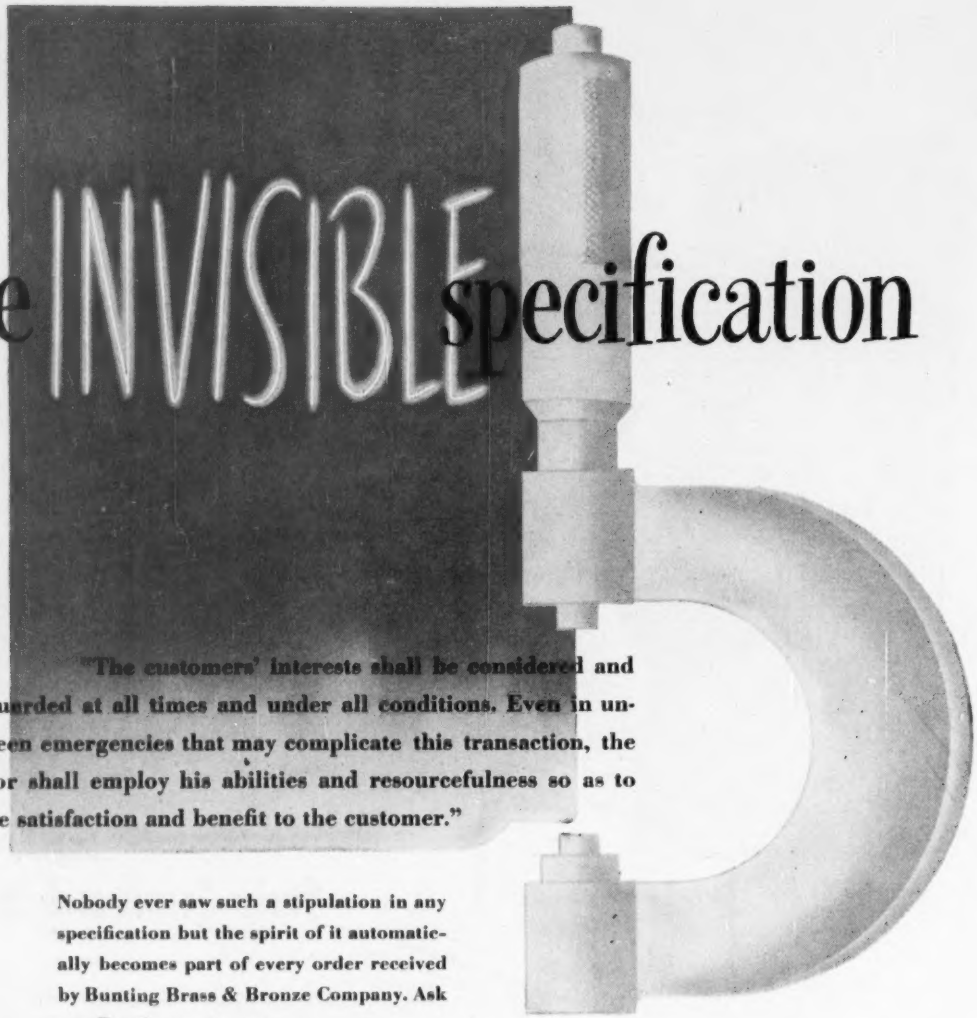
CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

the INVISIBLE specification



"The customers' interests shall be considered and safeguarded at all times and under all conditions. Even in unforeseen emergencies that may complicate this transaction, the vendor shall employ his abilities and resourcefulness so as to insure satisfaction and benefit to the customer."

Nobody ever saw such a stipulation in any specification but the spirit of it automatically becomes part of every order received by Bunting Brass & Bronze Company. Ask any Bunting customer.



THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

Tool Steel Topics

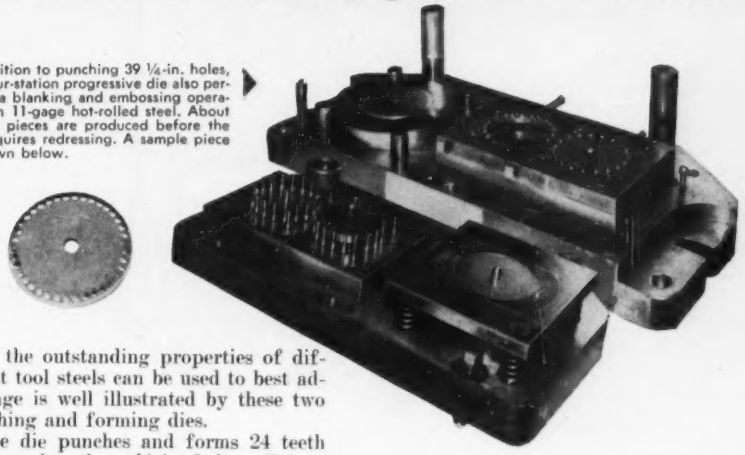
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export ...

BTR and LEHIGH H team up to form 24 teeth, punch 39 holes

In addition to punching 39 ¼-in. holes, this four-station progressive die also performs a blanking and embossing operation on 11-gage hot-rolled steel. About 25,000 pieces are produced before the die requires redressing. A sample piece is shown below.



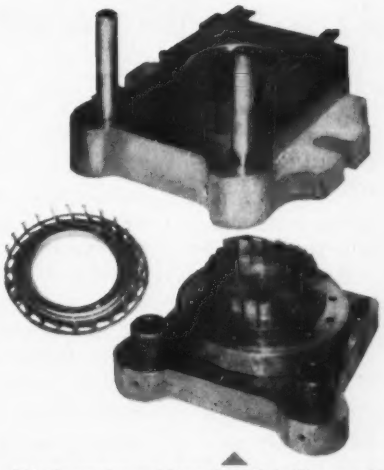
How the outstanding properties of different tool steels can be used to best advantage is well illustrated by these two punching and forming dies.

One die punches and forms 24 teeth and punches three ¼-in. holes, all in a single operation. The other die punches 39 holes of ¼-in. size, blanks out the piece, and embosses it.

The punches of both dies are made of BTR, our manganese-chromium-tungsten oil-hardening steel with a hundred and one uses. It has plenty of wear-resistance, and it takes the shock of the punching operation. BTR is easy to machine and heat-treat. And it's economical.

The die rings for both dies are made of Lehigh H, our general-purpose grade of high-carbon, high-chromium steel. This air-hardening grade is first choice wherever it's essential to have minimum distortion during heat-treatment. In addition, Lehigh H provides long-wearing properties for those long runs. You just can't get a better tool steel when you need accuracy and long wear.

Both these Bethlehem grades are stocked in popular sizes by Bethlehem tool steel distributors in principal cities everywhere, and in our mill depot.



This die punches and forms 24 teeth in 18-gage cold-rolled steel and punches three ¼-in. holes. About 50,000 pieces are produced before redressing.



METALLURGICAL SERVICE — Bethlehem metallurgists are on call whenever you have problems. They'll assist with the selection of tool steel, or its heat-treatment, forging, grinding, machining, design, etc.

Sometimes it takes more than just good tool steel

In a customer's plant the other day we asked the shop boss the name of the tool steel he used for a blanking die which we saw in his shop.

"Sorry, but I just can't tell you. All I know is, it works fine. We used to have a lot of trouble with that die . . . and then one of your Bethlehem men came in here one day. He worked with the die all day, and he cured the trouble for good."

Later we checked with the toolroom and found that the grade used for the die was BTR, our general-purpose, oil-hardening tool steel — and a mighty reliable one, too. The fact that the superintendent didn't know its name was probably a compliment. It was doing a good job. He no longer had to worry about it. So the name didn't matter.

The point is, it takes more than the best tool steel to make some tools and dies work right. Sometimes what counts most is the service that goes with the tool steel — our vast experience in applying each grade, the sales service, metallurgical service, and distributor service.

"Service" is often a glib promise, an intangible sales point. But we at Bethlehem look on service as an inseparable part of our product, something that goes along with every bar of steel we ship.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Special treatment often permits using carbon tool steel

We have run across several customers who use carbon tool steels for tools and dies that others would ordinarily make from oil- or air-hardening tool steels. This is real economy.

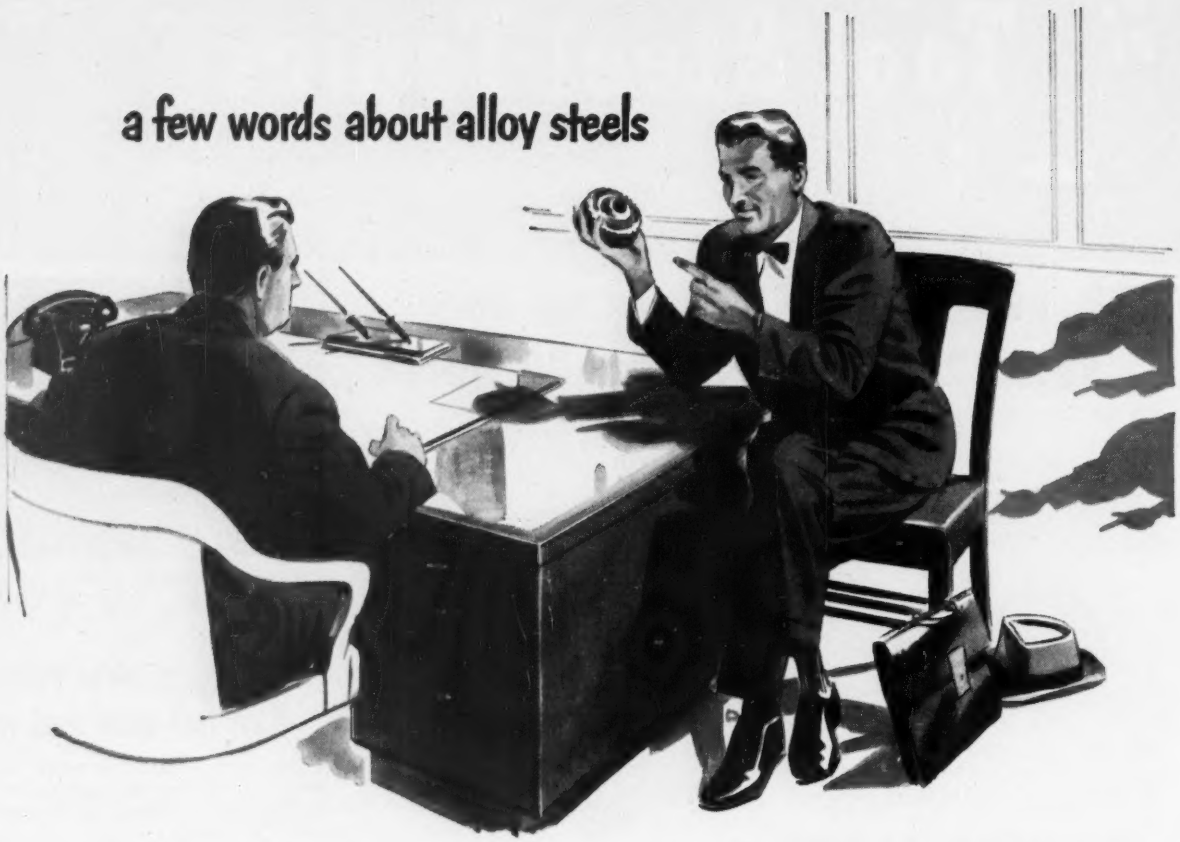
The secret in most cases is in the design of the tool. Avoided are: sharp corners, small projections from heavy sections, numerous holes with both thick and thin webs. If the tool can be designed to minimize such hazards, carbon tool steel is often an effective solution.

When there are many holes in a die made from carbon tool steel, a good heat-treater will carefully pack the holes with asbestos or fire clay, then heat carefully and uniformly to obtain a well-hardened die. This precaution reduces distortion during heat-treatment and avoids causing cracks in quenching.

HEAT AND TEMPER COLORS SHOWN ON HANDY CHART

Want to estimate the temperatures of heated steel? Our convenient color chart is printed in natural tones; heat colors are accurately reproduced on one side and temper colors on the other. Write for your free copy to Publications Dept., Room 1042, Bethlehem, Pa.

a few words about alloy steels



or, where you can use Boron Steels, we *can help you*

If you are faced with the problems of allocations and shortages of the alloy steels you've been accustomed to use, you can probably make your job easier by shifting to Republic alternate grades or *boron* type alloy steels.

Republic has been producing boron steels commercially for more than 10 years. In that time we have made more tons of boron steels than any other alloy producer. Which means that we have solved more problems of shifting to boron alloys, have assembled more knowledge about the boron grades than any other producer.

Our 3-Dimension Metallurgical Service can give you the help you need to switch your production to alternate alloys or boron steels quickly and with the fewest headaches. A Republic Field Metallurgist analyzes your products and production set-up right in your plant. Then he goes over your case with the other two members of the 3-Dimension team... the Republic Mill and Laboratory Metallurgists.

The result? If the parts you are making from alloy steels are adaptable to *boron* steels, you'll get expert answers and recommendations that will speed you into boron-grade production promptly.

Boron steels aren't always the answer, may not solve every problem . . . your Republic Field Metallurgist will give you honest advice, backed by Republic 3-Dimension Metallurgical Service.

When may we call?

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

LAB FIELD MILL
3-DIMENSION Metallurgical Service

REPUBLIC STEEL

Republic ALLOY STEELS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing



Ask ALCOA about threading and tapping aluminum screw machine stock

Cutting threads in aluminum is easy if you follow simple procedures of alloy selection, tool preparation and machine setup.

Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

Taps and dies remove a large amount of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part near the tolerance limit favoring the removal of the least amount of metal.

Both taps and dies should have a top rake angle ground on the leading edge of the tool. On some jobs, both taps and dies will cut better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. Tap flutes should be highly polished. Tap lands should be relatively narrow to reduce friction between the tool and the work.

Your local Alcoa sales engineer will gladly answer your questions on machining, alloy selection and finishing. You'll find him listed under "Aluminum" in the classified phone book.

ALUMINUM COMPANY OF AMERICA
870-J Gulf Building · Pittsburgh 19, Pennsylvania



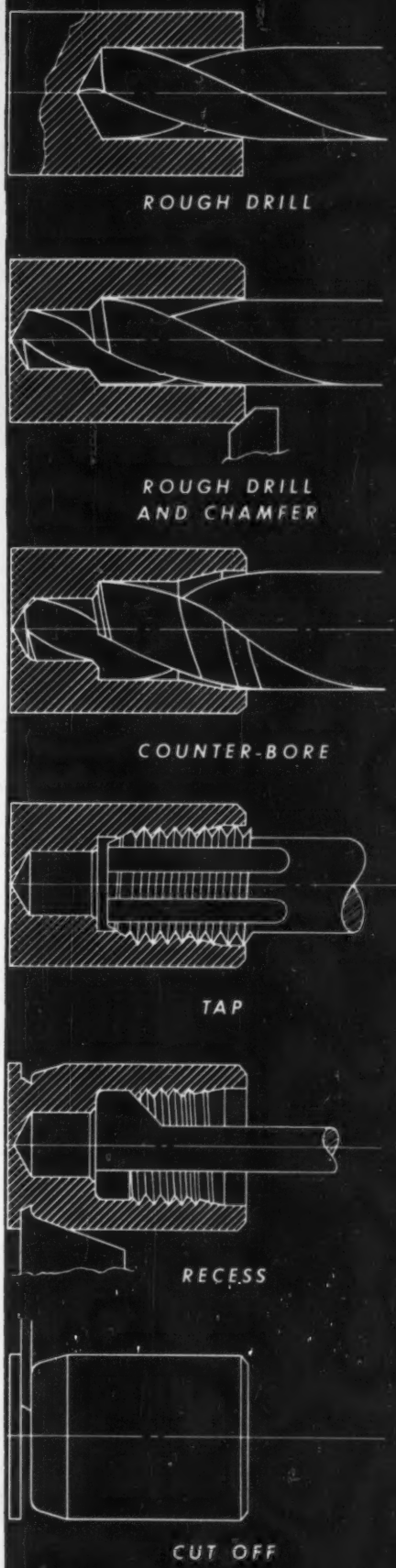
ALCOA OFFERS TWO BOOKS — *Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

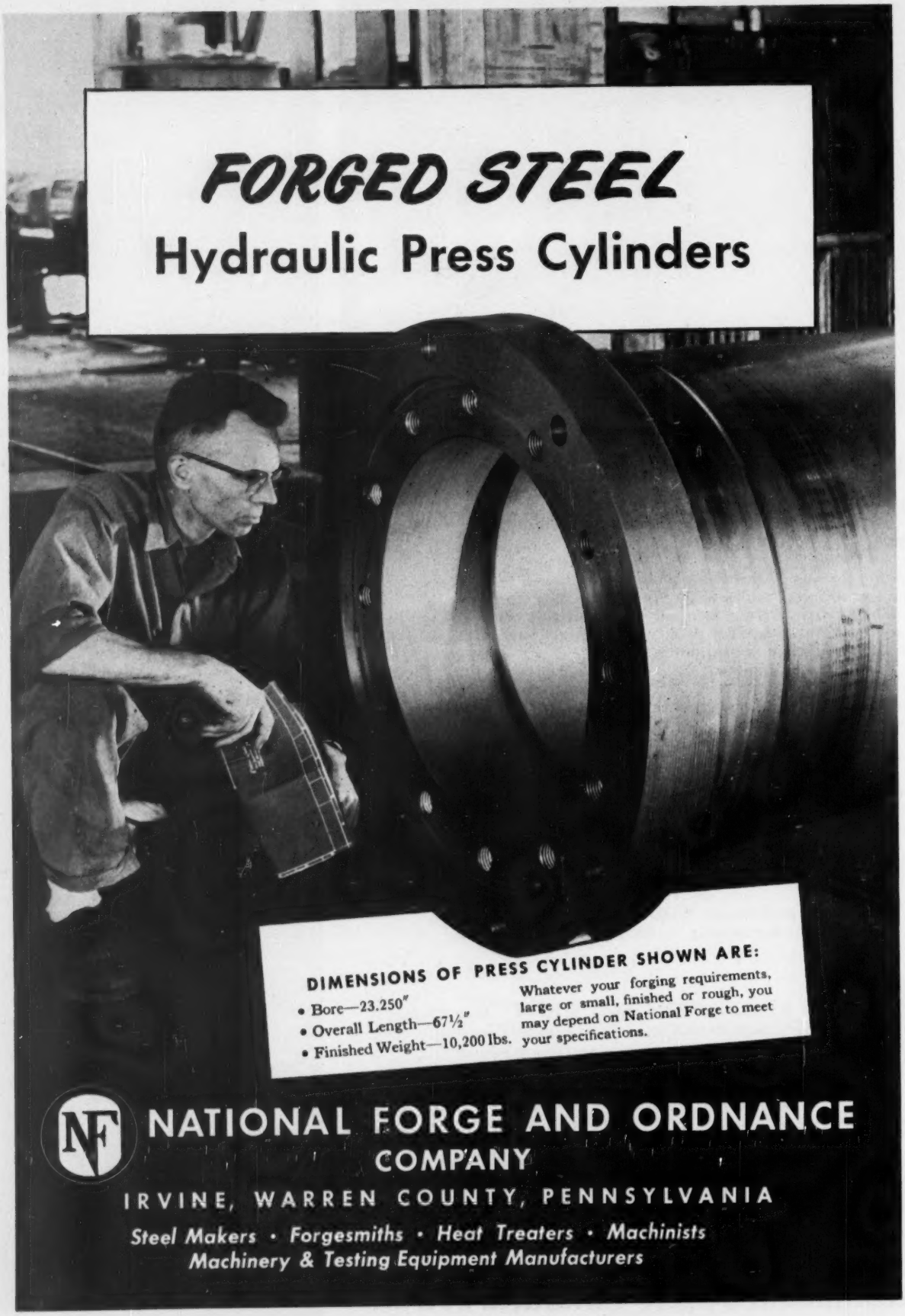
Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

ALCOA

ALUMINUM SCREW MACHINE STOCK

"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.

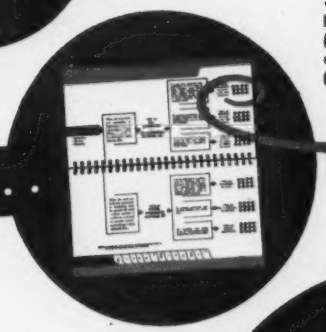



FORGED STEEL
Hydraulic Press Cylinders
DIMENSIONS OF PRESS CYLINDER SHOWN ARE:
• Bore—23.250"
• Overall Length—67½"
• Finished Weight—10,200 lbs.
Whatever your forging requirements, large or small, finished or rough, you may depend on National Forge to meet your specifications.
NATIONAL FORGE AND ORDNANCE COMPANY
IRVINE, WARREN COUNTY, PENNSYLVANIA
Steel Makers · Forgesmiths · Heat Treaters · Machinists
Machinery & Testing Equipment Manufacturers

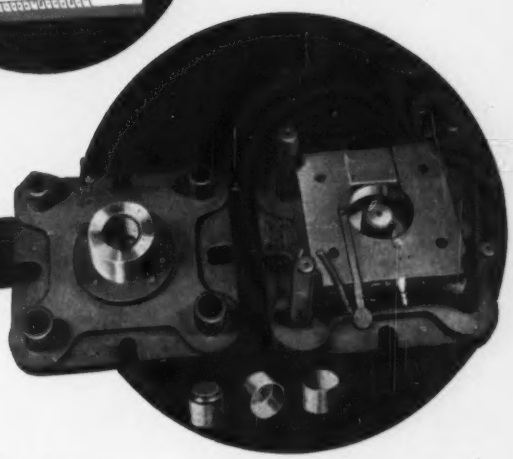
How ONE TOOLMAKER . . .



USED THIS GUIDE . . . . . —then use HAMPDEN *(Oil-Wear)* or No. 610 *(Air-Wear)*



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 105 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Call Your Nearest Carpenter Warehouse or Distributor

DON'T WAIT... COOPERATE!
The U.S. Needs Your Steel Scrap, Now

Carpenter

MATCHED TOOL & DIE STEELS

Export Department: Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

For your convenience, Carpenter carries warehouse stocks in principal cities throughout the country



How do you Guide a Missile?

WHAT does it take to put a "brain" in a projectile —a "mind" that makes it know where to go, and when to explode? For that matter, how do you open garage doors and light the driveway at the beep of your horn . . . or throw out one faulty package from thousands in a food-packing plant?

It takes special metals for such miracles—high-alloy steels and special magnetic materials of the types in which we have pioneered and are today leading producers. For any job which requires something more than ordinary steels can give you, look first to the ***Allegheny Ludlum Steel Corporation . . . General Offices: Oliver Building, Pittsburgh 22, Pa.***

PIONEER in Specialloy Steels

Allegheny Ludlum

WAD 3975

AL
TIME-TESTED STAINLESS STEEL

Cuts machining time



THE BASIC SHAPE
IS ALREADY MADE WHEN YOU USE
Shelby Seamless

● You can do practically anything with a tube that you can do with a solid round bar—and you save the cost of the hole.

Thousands of machine shops take advantage of this fact and produce high quality machined parts at savings up to 50% with the aid of Shelby Seamless Mechanical Tubing.

Boring and extensive machining can be minimized—sometimes eliminated—with Shelby Seamless. You save time, labor, materials, as well as wear and tear on expensive tools. You can often select just the right tube for your job, because Shelby Seamless is made in so many sizes, wall thicknesses, steel grades and finishes. Some shops find they can simply cut the tube to length, and with a clean-up finishing operation, the job is through.

When you get into *volume* production, it's reassuring to know that with Shelby Seamless, uniformity can be taken for granted, due to our tightly controlled manufacturing process. Whether you make one part, or hundreds or tens of thousands, this dependable uniformity makes it possible to closely estimate your time, labor and material.

Our engineers will be glad to help you utilize the many advantages of Shelby Seamless for your product. Meantime, send for our free Bulletin Number 17. It may help you cut time and costs—and make a better product in the bargain.



All National Seamless Tubes are pierced from a billet of high quality steel. This is the one manufacturing method that assures absolutely uniform wall strength.



NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S SHELBY SEAMLESS MECHANICAL TUBING

UNITED STATES STEEL

WE'VE MADE MILLIONS OF THEM



Still turning them out, too — a steady stream of drop forgings for the petroleum, mining, aviation, automotive, electrical and other industries. Turning them out in volume and great variety . . . so that many different needs may be served.

They're good forgings, made of good steel by able, experienced shopmen. What's more, every step of manufacture is carefully checked by our metallurgical division. We know of no better formula to insure high quality; to insure that Bethlehem drop forgings will do the job intended.

There are probably many times when your specifications call for closed-die forgings—drop, press, or upsetter. Perhaps Bethlehem's experience in this field could make things easier. We'll do everything possible to co-operate, and to help fill your present or future needs.

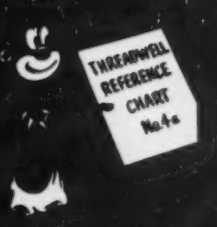
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Threadwell DRILLS





THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

HSS DRILLING SPEEDS & FEEDS for Various Materials

For Carbon use 40% to 50% of speeds indicated

MATERIAL	SPEED IN FEET PER MIN.	DRILL DIAMETER								
		1/16 TO 1/8	5/32 TO 1/4	9/32 TO 3/8	13/32 TO 1/2	17/32 TO 3/4	25/32 TO 1	1 1/32 TO 1 1/4	1 9/32 TO 1 1/2	1 1/2 AND LARGER
		FEED PER REVOLUTION INCHES								
Aluminum	250 TO 300	.002 TO .003	.003 TO .005	.005 TO .006	.006 TO .008	.008 TO .010	.010 TO .013	.013 TO .015	.015 TO .016	.016 TO .018
Brass or Bronze	150 TO 200	.002 TO .004	.004 TO .007	.007 TO .010	.010 TO .014	.014 TO .018	.016 TO .022	.020 TO .026	.026 TO .030	.030 TO .040
Forgings: Alloy Steel	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026
Forgings: Alloy Steel Heat Treated	45 TO 60	.002 TO .003	.003 TO .004	.004 TO .005	.005 TO .006	.007 TO .010	.009 TO .012	.010 TO .014	.012 TO .016	.014 TO .022
Iron: Cast Malleable	75 TO 110	.002 TO .004	.004 TO .006	.006 TO .009	.009 TO .012	.012 TO .016	.014 TO .020	.018 TO .025	.022 TO .028	.022 TO .030
Monel Metal	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026
Steel: Carbon .2 to .3	70 TO 95	.002 TO .003	.003 TO .005	.005 TO .007	.006 TO .010	.010 TO .014	.014 TO .016	.016 TO .022	.018 TO .025	.020 TO .028
Steel: Cast Nickel, 3½%	60 TO 75	.002 TO .003	.003 TO .005	.004 TO .006	.006 TO .010	.010 TO .014	.014 TO .016	.016 TO .022	.018 TO .025	.020 TO .028
Steel: Molybdenum Stainless Tool	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026

CARBIDE DRILLING SPEEDS IN SURFACE FEET PER MIN.

MATERIAL	Drill Diam.	Speed	MATERIAL	Drill Diam.	Speed
Non-ferrous Alloys	....	150	Glass	....	20
Cast Iron (Soft)	1/8 to 7/16	70	Steel (Over 375 Brinell)	....	100
Cast Iron (Soft)	9/16 to 1	85	Plastic (Phenolic, etc.)	....	100
Cast Iron (Soft)	1 or more	125	Plastic (Glass Bonded)	....	50
Cast Iron (Chilled)	....	30	Wood	....	200

Threadwell

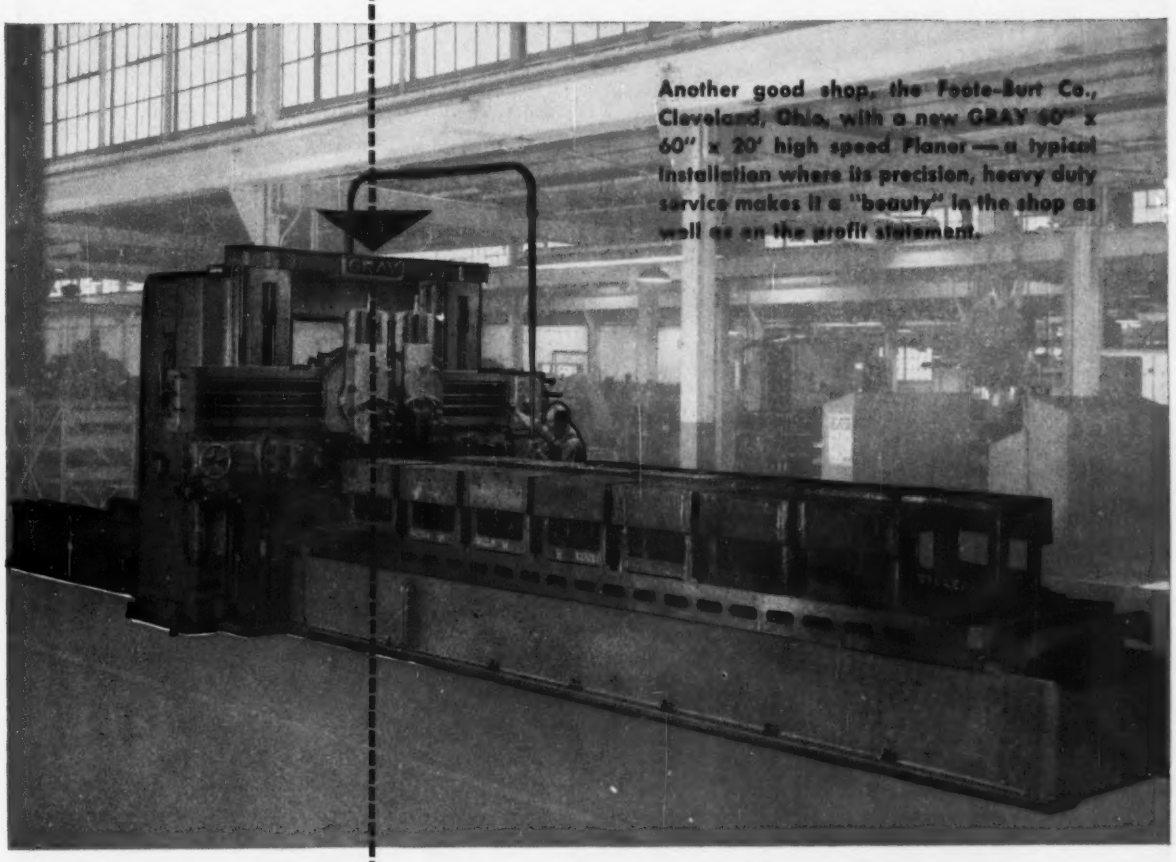
Threadwell Tools do many jobs



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THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

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Another good shop, the Foote-Burt Co., Cleveland, Ohio, with a new GRAY 60" x 60" x 20' high speed Planer—a typical installation where its precision, heavy duty service makes it a "beauty" in the shop as well as on the profit statement.

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. . . recognized by machine shops throughout the world as the ultimate in planers. Built for high production with great precision, combining more original engineering developments and production features than any other planer . . . it is in such demand that GRAY is the largest planer builder.

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Both plant and product designed for precision work. Gears, Good Gears Only, custom made to your specifications. Electronically tested to assure quiet operation.



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"Gears . . . Good Gears Only"



Operator confidence soars—and so does production—with the Schrader Press Control. For this control is definitely a two-hand device. It is designed so that the hands that feed the die must also operate the press. Both hands must be used simultaneously for each operation of the press and cannot stray into the danger zone when the ram comes down.

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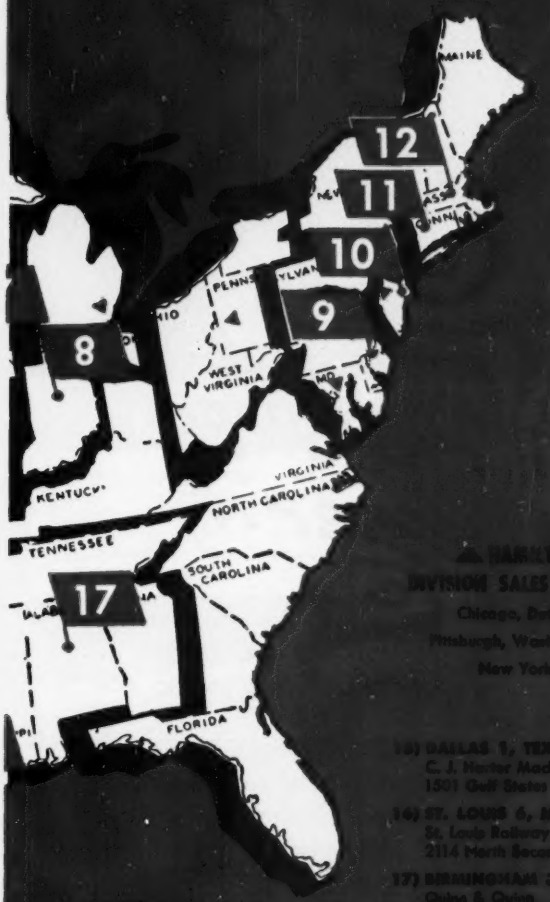


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When you buy Niles machine tools—*the brute force machines with the precision touch*—you've made a big investment. So we want you to take full advantage of the unusual efficiencies that are built into them.

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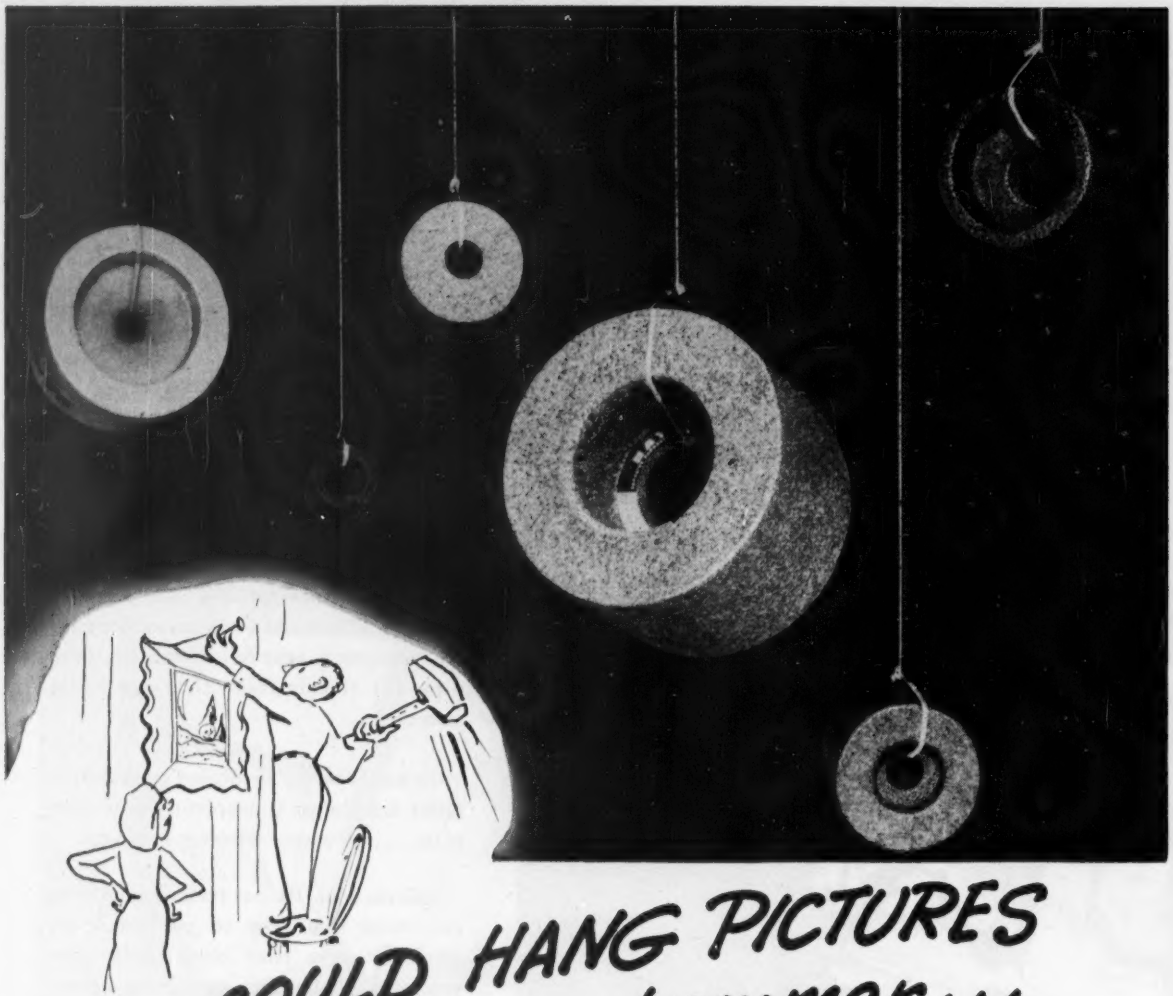
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but . . . you shouldn't — nor should you use just any internal grinding wheel when you can use Bay State's . . . proven best in the field for the countless inside grinding jobs that call for speed and accuracy.

Deservedly popular, Bay State Internal Grinding Wheels are:

- **UNIFORM** — due to exacting standards of manufacture
- **TRUE-RUNNING** — because of accurate centering
- **LONG-LASTING** — because they fit-the-job, through the proper selection of grit and grade. (That's where Bay State engineering experts will really help you.)

BAY STATE

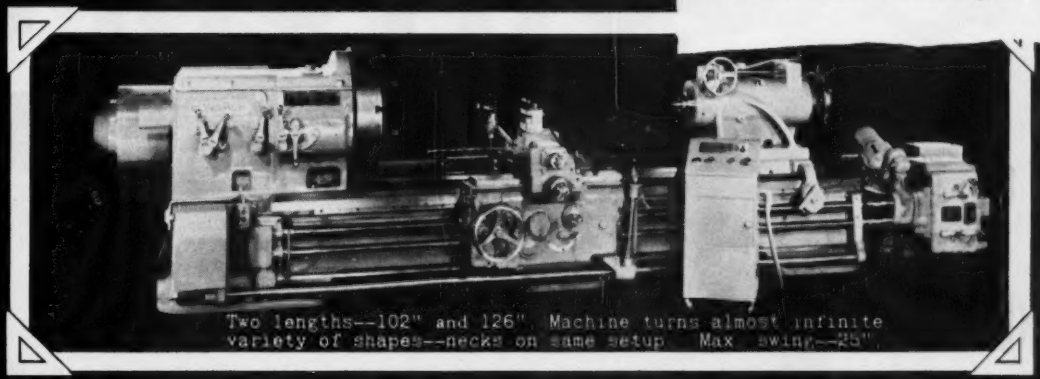
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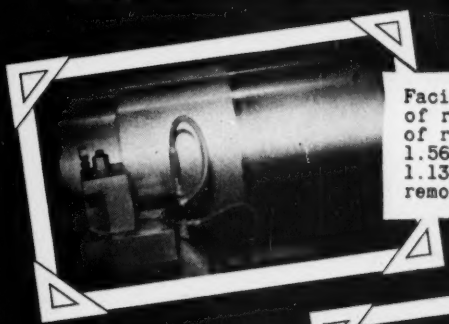
BAY STATE'S current expansion program includes a new 250 foot kiln plus a 30% increase in plant capacity... this means better deliveries to you.

A SNAP FOR STEEL PRODUCERS!

This Tracer-Controlled Monarch Heavy Duty Roll-Turner Produces 3 to 6 Times Faster! Offers Many Other Great Advantages.

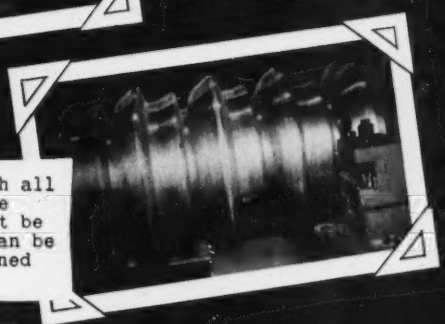


Two lengths--102" and 126". Machine turns almost infinite variety of shapes--necks on same setup. Max. swing--25".



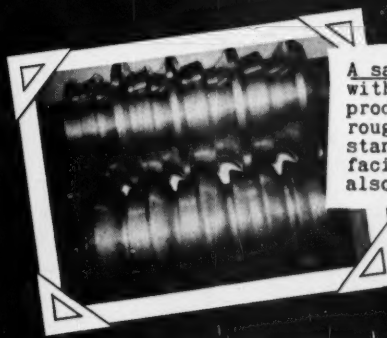
1st HOUR

Facing begun on first of pair of rail section rolls. Body of roll--40-1/2". Rolls are 1.56% carbon, 0.77% nickel, 1.13% chromium. Total metal removed, 3730 lbs. per roll.



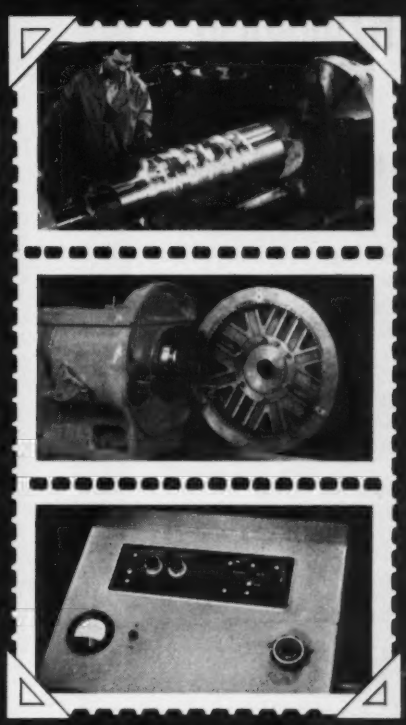
10th HOUR

Roughing completed. With all rolls from given template identical, rolls need not be matched in pairs. One can be redressed or new one turned with assured match.

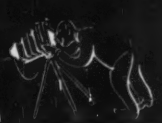


26th HOUR

A savings of 99 hours compared with conventional roll lathe production. Both rolls faced, roughed and finished. Only standard carbide round nose and facing tools used--a huge savings also in form tool inventory.



TOP - Another typical operation.
CENTER - Face plate removed. Power applied far from work axis on large diameter rolls.
BOTTOM - Complete push button control exclusive with Monarch.



Focus on Monarch for all your turning needs.

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TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER ...TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., SIDNEY, OHIO
Please send me without obligation your complete illustrated Heavy Duty Roll-Turner Booklet No. 1302.

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The UCHTORFF

NEW 600 TON METAL DRAWING LAKE ERIE HYDRAULIC PRESS

in the Uchtorff plant

"We are proud of this press," says Mr. A. F. Uchtorff, president of the company. "Our customers and prospects are pleased too for now they have efficient metal forming facilities nearby for large pieces as well as the smaller ones formed on our original press. Our Lake Erie presses are saving time and money for our clients."



● Repeat orders are the rule at Lake Erie

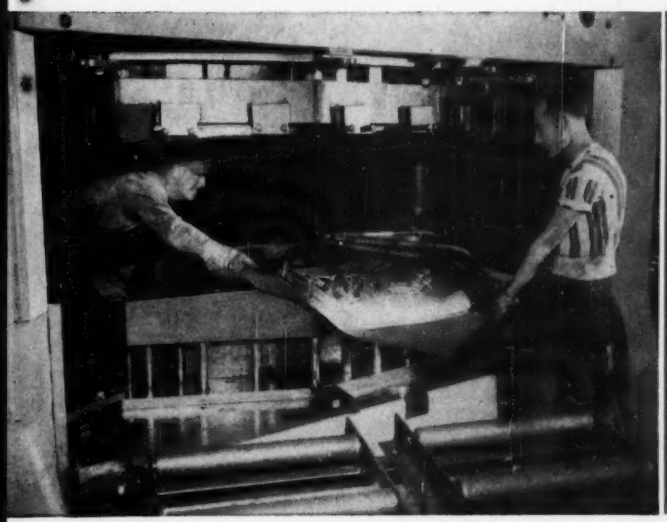
Being so satisfied with your first Lake Erie press that you soon want another is typical. It is the recorded experience of hundreds of leading plants...the best evidence in the world of the production improvements you can count on with Lake Erie hydraulic equipment.

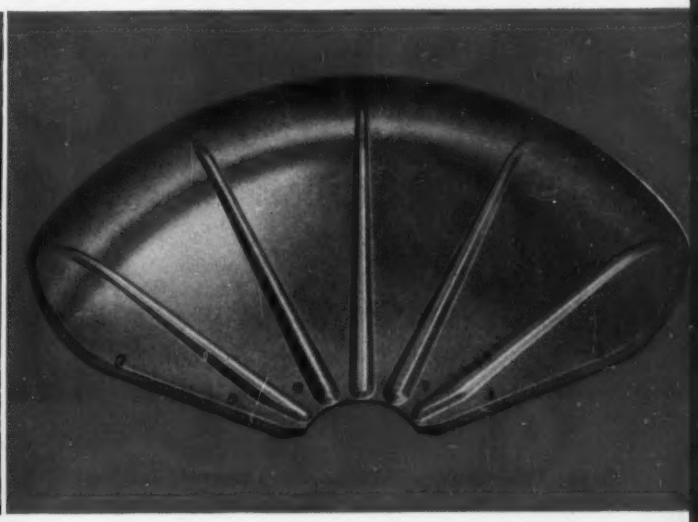
Success Story...

...another tribute to versatile

LAKE ERIE HYDRAULIC PRESSES

"Satisfy the customer's need," is the successful policy of The Uchtorff Company, Davenport, Iowa. In selecting Lake Erie Hydraulic Presses for their plant, Uchtorff acquired ideal equipment for this purpose. The first press quickly attracted and built-up a profitable volume of business. The second, and bigger press, is greatly expanding it in the farm implement, tractor and other fields requiring large drawn and formed parts. Versatile . . . fast . . . dependable . . . and efficient, Lake Erie Hydraulic Presses are "satisfying customer's needs" in hundreds of leading plants today. The newest presses are setting unmatched production records for a surprising variety of metal forming jobs. Why not ask us about these applications for your plant? Glad to have you. No obligation. Write or phone.





● New 600 ton press with 200 ton hydro-pneumatic die cushion is shown forming hood wrapper for farm harvester. Piece is formed out of 22 gage deep draw steel and measures 34½" side to side by 48" top to bottom. Depth of draw is 5". Tonnages employed on this job are 400 on top platen and 100 on die cushion. Other typical parts formed on the Lake Erie presses are farm tractor fenders, farm tractor engine oil pans, farm plow depth gauge wheels and farm tractor engine valve covers. The unusual speed with which dies can be set up or changed is another important production advantage of Lake Erie hydraulic equipment.

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ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE ENGINEERING CORP.

MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

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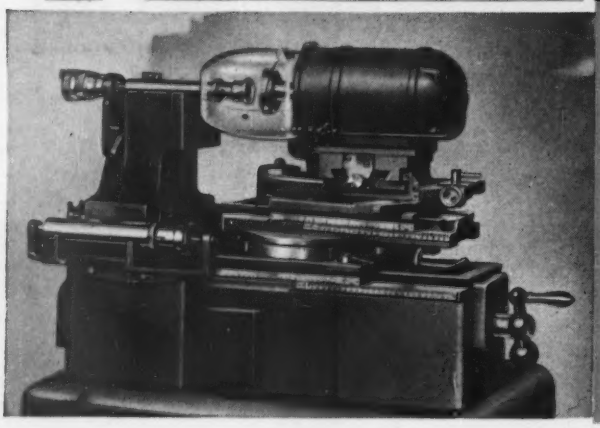
LAKE ERIE HYDRAULIC PRESSES are available in any size . . . standard, modified and special designs—horizontal and vertical types—for Metal Working—Plastics Molding—Forging—Metal Extrusion—Processing—Vulcanizing—Laminating—Stereotype Molding—Die Casting—Briquetting—Baling—Special Purpose.

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Manufactured in Canada by: Canada Iron Foundries Limited

LAKE ERIE ®

"Producing the very finest hydraulic machinery possible to help manufacturers produce more efficiently"





REMOVING BURS (above) from brass lens-coating plate. The right file for use on this ductile metal is the Nicholson Brass File (illustrated). Its short upcut angle prevents file from running off the work. Its long overcut produces many tooth points on the upcut to break up filings; also allows file to clear itself of chips.

LATHE FILING (upper left) cast-iron housing part of Micro-Surfacer. The right file for smoothing work spun on a lathe is the Nicholson Long Angle Lathe File (illustrated). Long angle of its single-cut teeth slides chips down and out, minimizing chances of filling up and of scratching metal being filed.

American Optical SPEEDS PRODUCTION

with "The right file for the job"

In the American Optical Company's recently developed Universal Micro-Surfacer (*illustrated*), startling new heights of accuracy and speed are attainable in the production of prescription optical lenses.

Properly shaped, accurately cut, uniformly hardened Regular and Special Purpose files are necessary for many of the hand finishing and fitting operations involved in its construction and that of other American Optical products. The Nicholson policy of *Twelve perfect files in every dozen* was undoubtedly an important factor in the selection of file brands. The files you see pictured in action are NICHOLSON.

Does the manufacture of *your* products call for rough, fast or precision filing? For difficult operations, accessibilities or surfaces? For use on brass, aluminum, babbitt, lead, plastics, stainless steel, die or foundry castings, lathe work? Nicholson has *The right file for the job*, in the highest quality obtainable—in either Nicholson or Black Diamond brand.

Sold through Industrial Distributors

FREE TECHNICAL BULLETIN on "TEN SPECIAL FILE TYPES." Also 48-page handbook, "FILE FILOSOPHY," on kinds, use and care of files. Write to the factory.

NICHOLSON FILE CO. • 18 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*





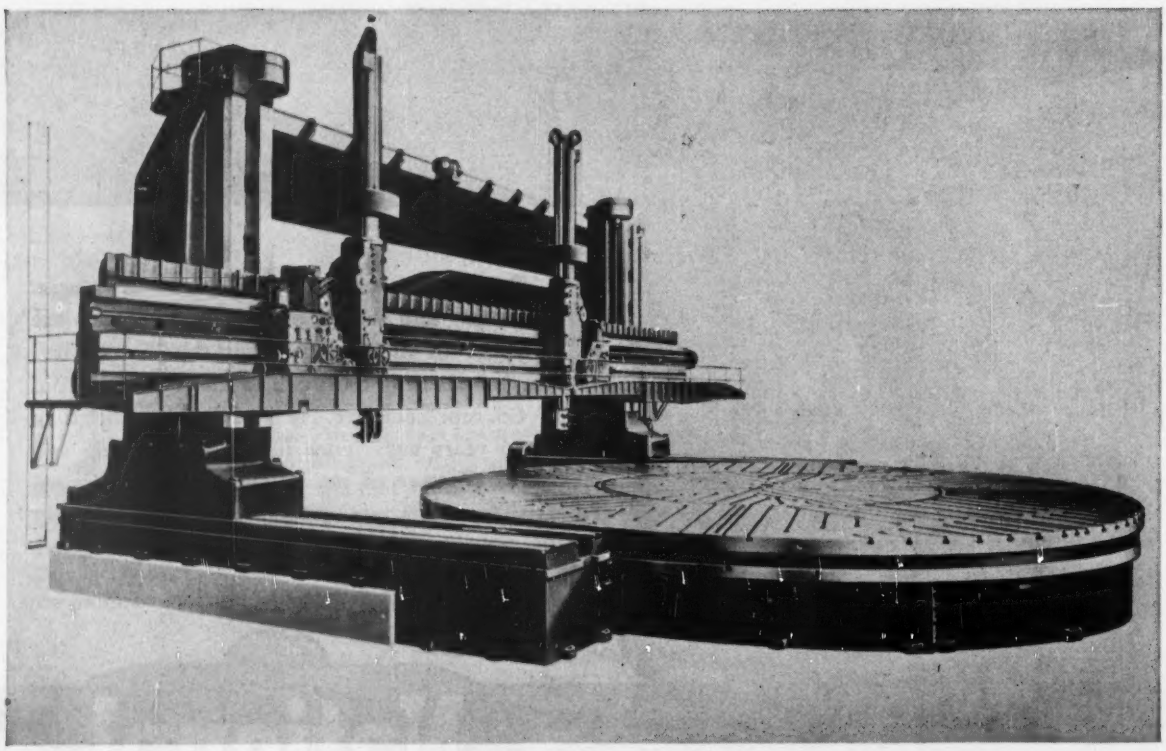
● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

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Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

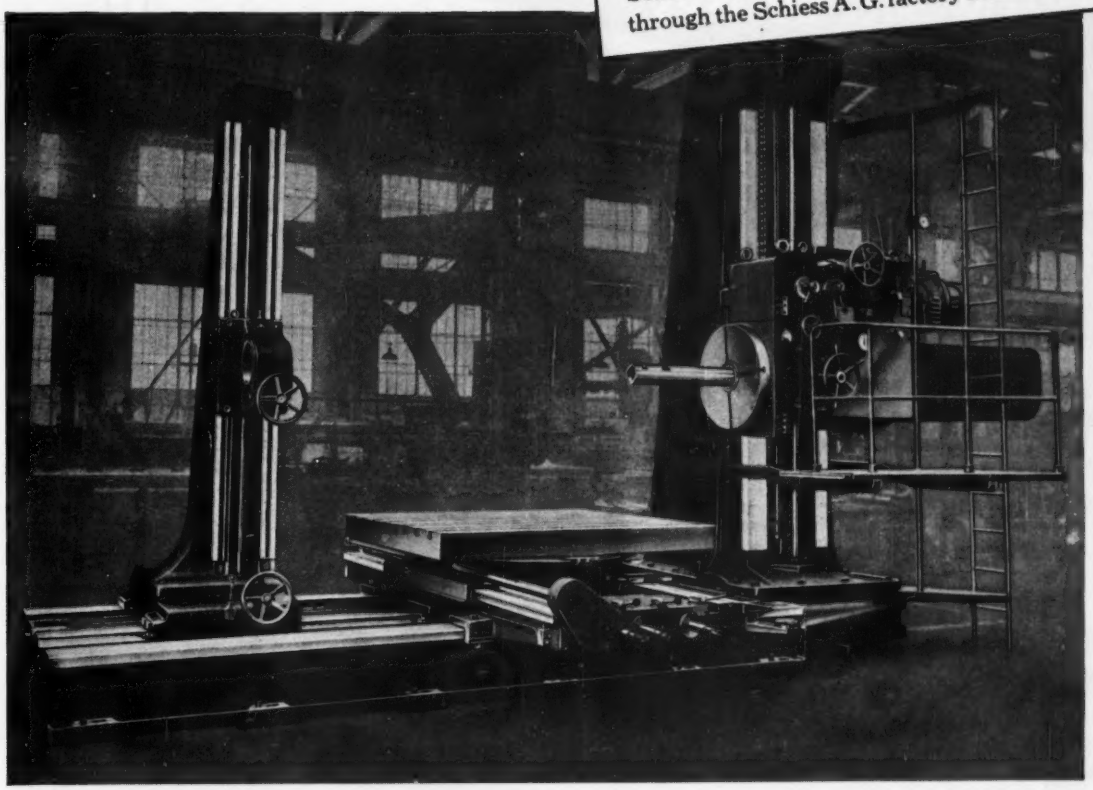
First time in U. S. A....

The World-famous Line of Schiess Heavy Machine Tools



MAMMOTH VERTICAL BORING MILL WITH 84 FT. TURNING DIAMETER, typical of the unusual heavy equipment built by Schiess. Smaller Schiess boring mills range from 71″ to 98″ turning diameter, and from 8′ 2″ to 23′ with work capacity from 5 to 6 tons and 10 to 100 tons.

You are cordially invited to visit the Schiess Exhibit at the **Second European Machine Tool Exhibition, Hanover, Germany, September 14-23.** Schiess representatives will also gladly take you through the Schiess A. G. factory in Duesseldorf.



HORIZONTAL BORING AND MILLING MACHINES—Model WBF with traversing column and high speed internal spindle and Model TWBF 16 (shown here) with fixed column and moving table. Spindle diameter of Model WBF from 6¼" to 12⅜". Maximum boring diameter 47" to 134". Longitudinal traverse of main spindle 53" to 98". Motors 17½ to 50 H.P.

Machine tools don't come much bigger—or better—than SCHIESS builds them, and has been building them for over 72 years to meet the precision requirements of Europe's largest metal working plants. Machines like these, for example—

Vertical Boring Mills up to 84 ft. turning diameter.

Vertical Turret Lathes up to 71" turning diameter.

Horizontal Boring and Milling Machines up to 12⅜" spindle diameter.

Gear Hobbers for cutting gears up to 23 ft. diameter and larger.

Crankshaft Turning Machines with internal turning diameters to 112".

Locomotive Tire Lathes with internal boring diameters to 88½".

Tool Grinders for the heaviest carbide and high speed steel tools.

Now American Industry can also obtain these world-famous heavy producers—and promptly, too—with the assurance that technical assistance will always be close at hand from Schiess-trained engineers at Kurt Orban's Cleveland Service Center; also spare parts.

Several SCHIESS machines are shown here with limited specifications, but you'll want the whole story on the particular equipment that's big enough for your *biggest* job. So, why not write today.

KO CO INC INDUSTRIAL IMPORTERS

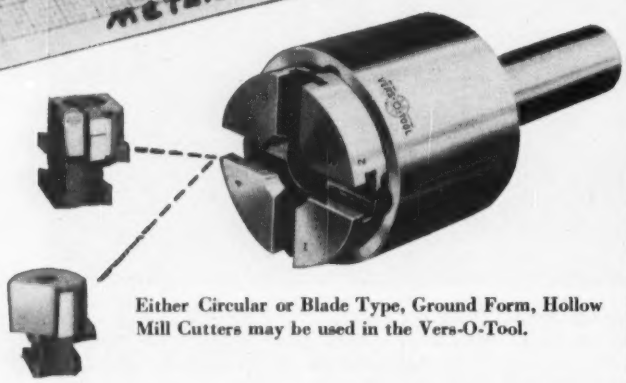
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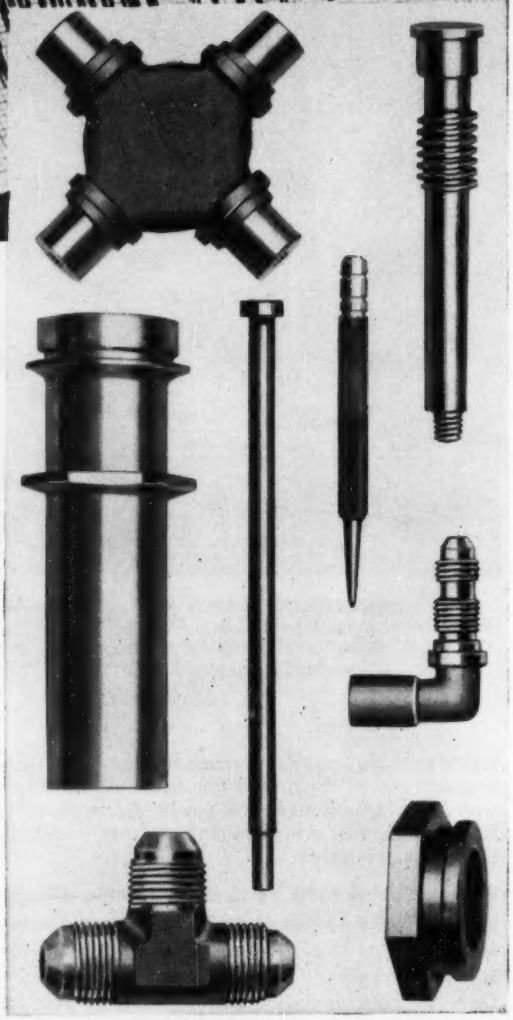
205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35
8735 Melrose Avenue, Los Angeles, California

FOR FINE FINISH... FASTER... USE VERS-O-TOOLS WITH HOLLOW-MILL CUTTERS





Either Circular or Blade Type, Ground Form, Hollow Mill Cutters may be used in the Vers-O-Tool.



If you are producing parts such as those pictured in the panel at the right, it will pay you to investigate the Vers-O-Tool method of hollow milling these jobs. You'll save time, you'll save additional grinding operations—and you'll save on tooling costs.

Hollow milling with these multiple cutter heads is three times faster than with single-point tools, and in some cases diameters are held to 5.5 micro-inch finish.

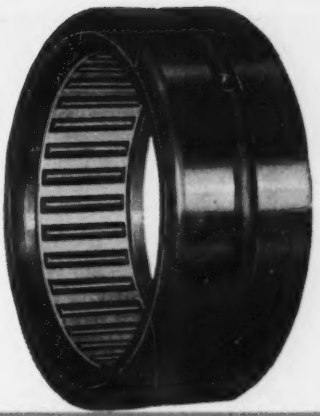
Namco circular milling cutters, for end forming, end turning, knurling, or burnishing, are interchangeable, die size for die size, with circular threading chasers for use in the same Vers-O-Tool heads. For complete details ask for Catalog D-51.

The NATIONAL ACME CO.

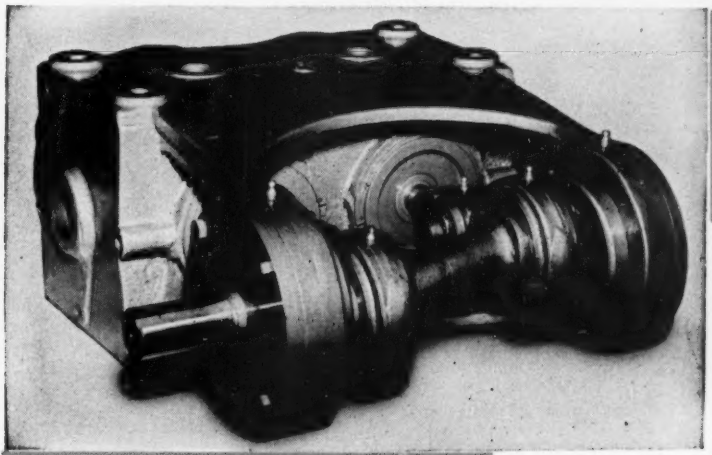
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

How Rialto Hydraulic Pumps save space-gain load capacity-increase bearing life on connecting rods



This Model 201 Rialto Hydraulic Pump is a two-stage fluid pump, featuring a low pressure phase and a high-pressure phase, operating independently. It is used for closing blow-out preventers in oil well drilling. Made by The Rialto Corp., Rialto, California.

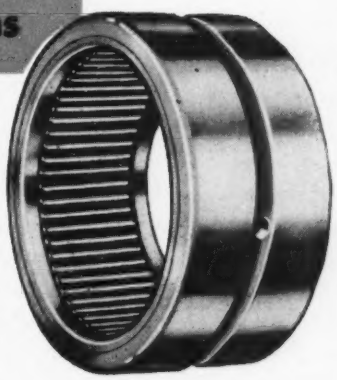


ORANGE *Cage Type* NEEDLE BEARINGS used on Crankshafts

Rialto engineers selected Orange Cage Type Needle Bearings for the main crankshafts because the exclusive cage design prevents roller skewing. All rollers are held in permanent alignment by a land-riding cage made of anti-friction, non-ferrous metal.

Orange Cage Type Needle Bearings have proved the solution for many applications unsuited to conventional needle bearings. For example, vertical applications — spindles — overhung mountings—relatively high speed applications. They are less affected by misaligned mountings or uneven loading; permit precision-controlled internal clearances for exacting needs; provide quieter running and longer life. Sizes from ½" to 8" shaft diameters.

ORANGE ROLLER BUSHINGS used on Wrist Pins



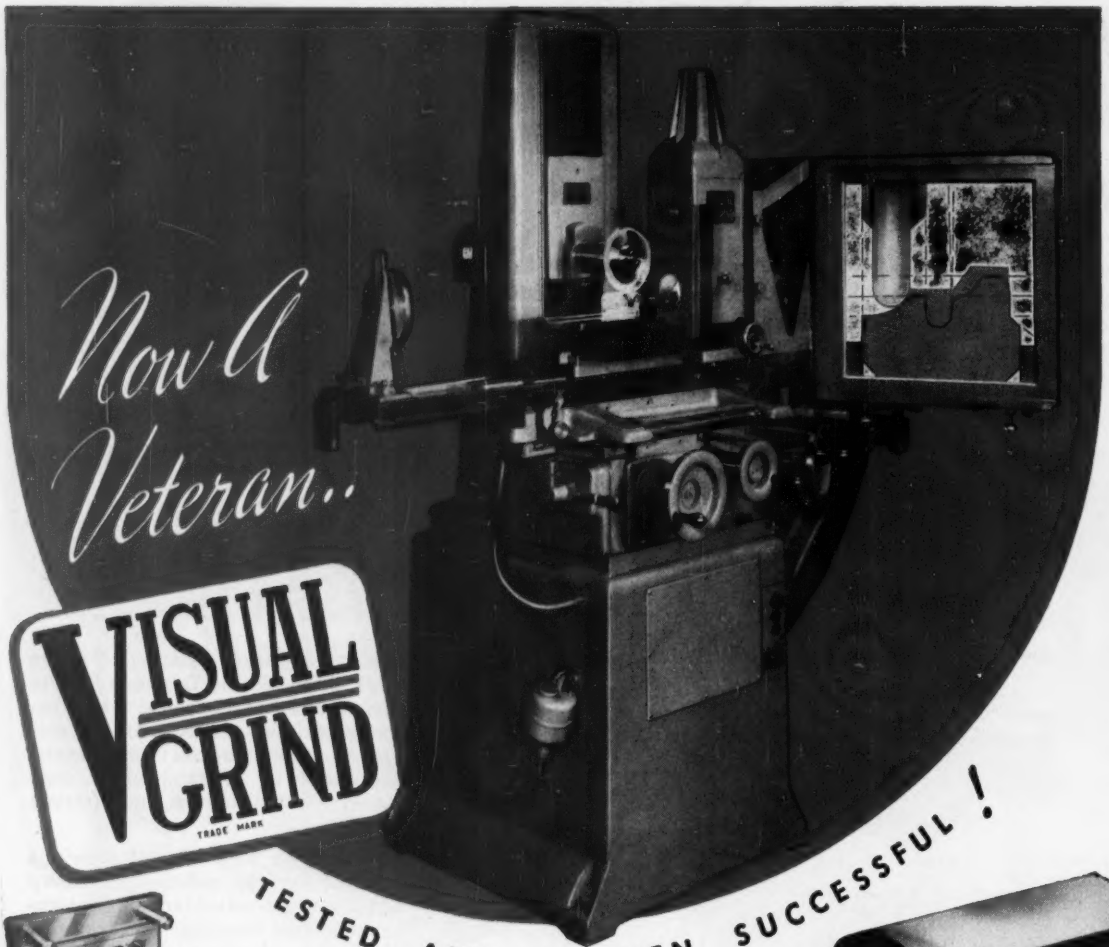
Smooth, friction-free oscillating motion of the two wrist pins is obtained by the use of Orange Roller Bushings. Closer internal running clearances minimize possibility of misalignment of rollers, eliminating bearing trouble at these critical spots.

Equally important, Orange Roller Bushings provide high load capacity in small space. They stand up in heaviest equipment, yet are precision-running to satisfy the most exacting requirements. Orange Roller Bushings are the answer to countless anti-friction bearing needs—whether heavy or light, large or small, high or low speed, revolving or oscillating. Full range of sizes, ½" to 8" shaft diameters.

Write for Engineering Data Books on Orange Roller Bushings and Orange Cage Type Needle Bearings, showing construction, dimensions, capacities etc.

Engineering representatives from coast to coast are available for discussion on any bearing application. Our engineering department invites you to submit your bearing problems or drawings for recommendation.

ORANGE ROLLER BEARING CO., Inc. 552 Main St., Orange, N. J.

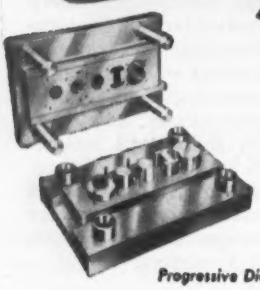


Now A Veteran..

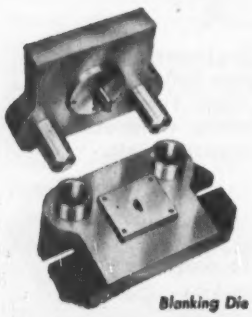
VISUAL GRIND

TRADE MARK

TESTED AND PROVEN SUCCESSFUL !



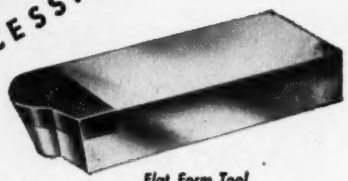
Progressive Die



Blanking Die

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

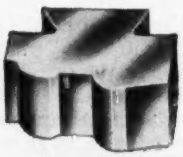
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Flat Form Tool



Circular Form Tool



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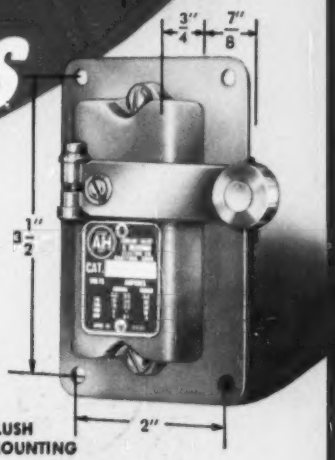
PROVIDES DEPENDABLE PERFORMANCE





ARROW **AH** HART

Limit Switches



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One of the most commonly used of all pilot devices, limit switches are an indispensable part of practically every machine tool and other electrical installation requiring that movement be stopped or changed in direction automatically.

Because they are vital to the proper operation of a wide variety of machines, Arrow-Hart Limit Switches are designed and manufactured to provide the greatest possible electrical and mechanical versatility, dependability and high performance. The snap-action mechanism makes or breaks contact at the correct speed regardless of the speed of travel of the actuating lever. Mounting to meet the requirements of practically any installation can easily be accomplished. The sturdy, cast enclosure with gasket provides ample protection against oil, dust, dirt and other break-down materials.

Key to high output and increased profit is dependable performance — and Arrow-Hart Limit Switches are basic for dependability. Send now for complete information stating your installation requirements. Write to: 103 HAWTHORN STREET, HARTFORD 6, CONN.

	AMPERES		
	Normal		Inrush
VOLTS	A.C.	D.C.	A.C.
115	15	2.0	40
230	10	0.5	20
460	6	—	10
600	5	0.1	8

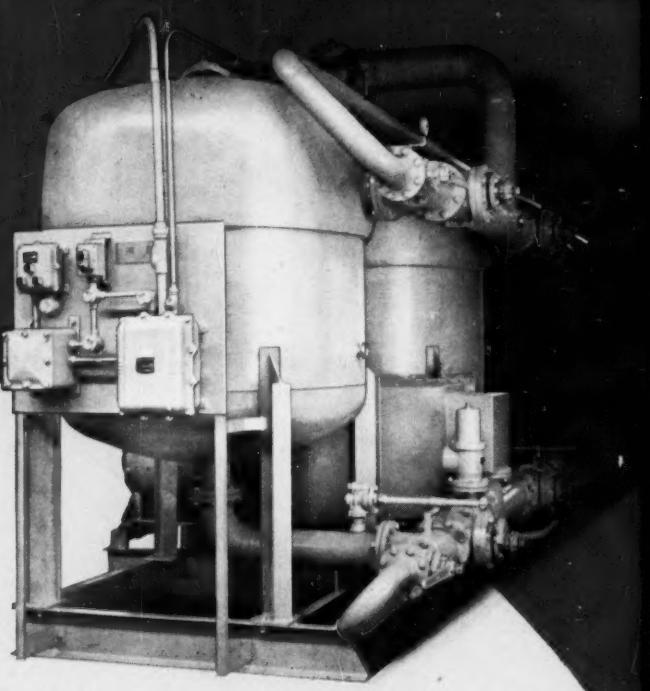
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Hazardous Locations

SELECTS ARROW AH HART



EXPLO-SAFE

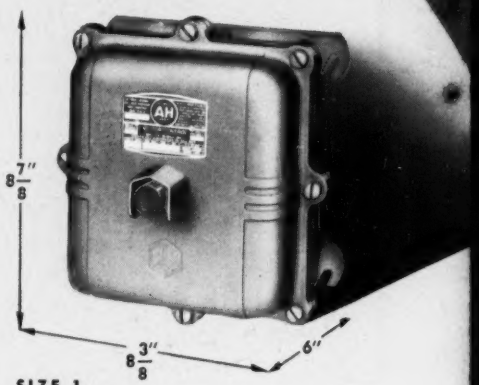
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The C. M. KEMP MFG. CO. — specializing exclusively in the design and manufacture of industrial gas machinery — is, naturally, well aware of the importance of selecting only **safe, dependable** motor controls of fine quality for equipment to be used in hazardous locations.

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Like all A-H Magnetic Motor Controls, EXPLO-SAFE features the exclusive Arrow-Hart RIGHT ANGLE Operating Mechanism. This first real advance in motor control design in over 20 years makes it possible to bring full safety plus new standards of performance and long-lived dependability to every hazardous and exposed installation.



SIZE 1
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A COMPLETE LINE OF EXPLO-SAFE STARTERS AND CONTACTORS IN SIZES 00 AND 0 THROUGH 4 WITH ALL AUXILIARY EQUIPMENT*

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- **ARROW-HART "RA" CONTROLS** for *every* motor control requirement, send for the complete new Arrow-Hart catalog, INDUSTRIAL MOTOR CONTROLS. Just fill in and mail the attached coupon.

*Approved by Underwriters' Laboratories. NEMA VII, IX Sizes 0 thru 3



ARROW-HART

INDUSTRIAL CONTROL DIVISION

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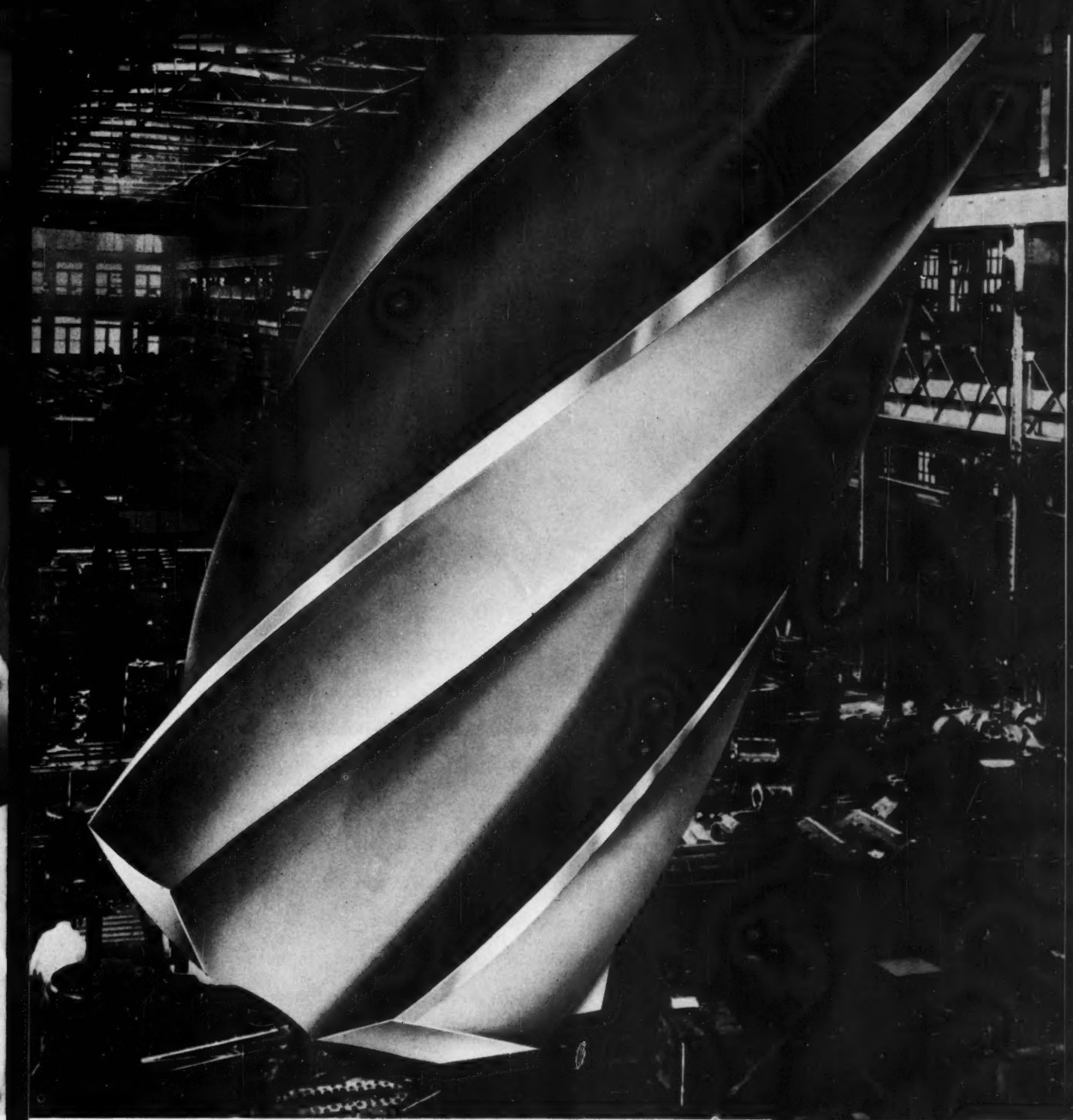
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WHATEVER YOUR DRILLING JOB... large or small . . . there's a UNION twist drill that's *right* for your material and *right* for your drilling equipment. Let your Union Distributor help you choose it . . . and you'll be sure of fast, free-cutting performance, less chance of breakage and more work between resharpenings. So, put the "first team in drilling" to work for you . . . today.

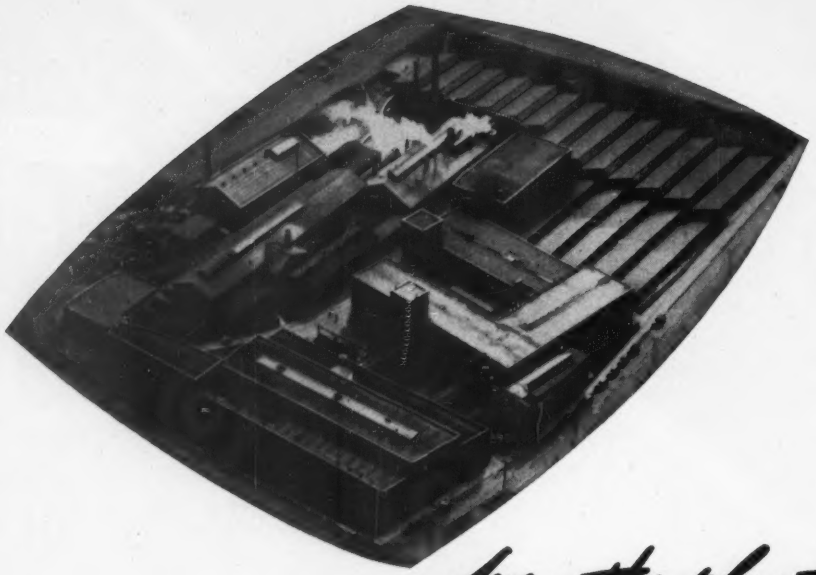


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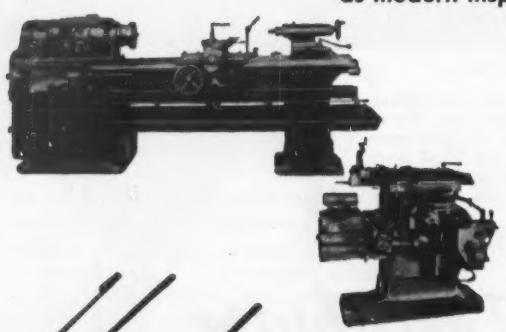
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS • Milling Cutters • Gear Cutters • Twist Drills • Hobs • Reamers • Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates



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No machine tool builder has ever surpassed Hendey's reputation for making *precision* machine tools. This reputation is based on an uncompromising standard established by the founder in 1870. This standard is exactly the same today. Only the method of achieving it has been changed—and constantly will be changed as new and better materials and techniques are developed. By concentrating all its efforts on just engine lathes and shapers, Hendey is able to provide the best thinking and the finest results in these fields. Hendey products are modern in design, are produced on modern equipment, and are as precise as modern inspection equipment will allow.



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MODERN *Hendey* precision engine lathes and shapers


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Smooth-Air Clutch
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Controls give
JET SPEED TO PRESSWORK!
These new Federals give "jet speed" to presswork. They are the perfect answer to faster production. With the new Smooth-Air Clutch and Electro-Pneumatic Controls, speeds may be increased safely; without damage to work, without sacrificing precision, and with no more than normal wear, thanks to balanced Federal construction. Operation is simpler — less fatiguing. May be "inched", single tripped, or operated continuously. Sizes 6 to 80 tons. Prompt delivery on all models including standard and dial feeds. Write for catalog.
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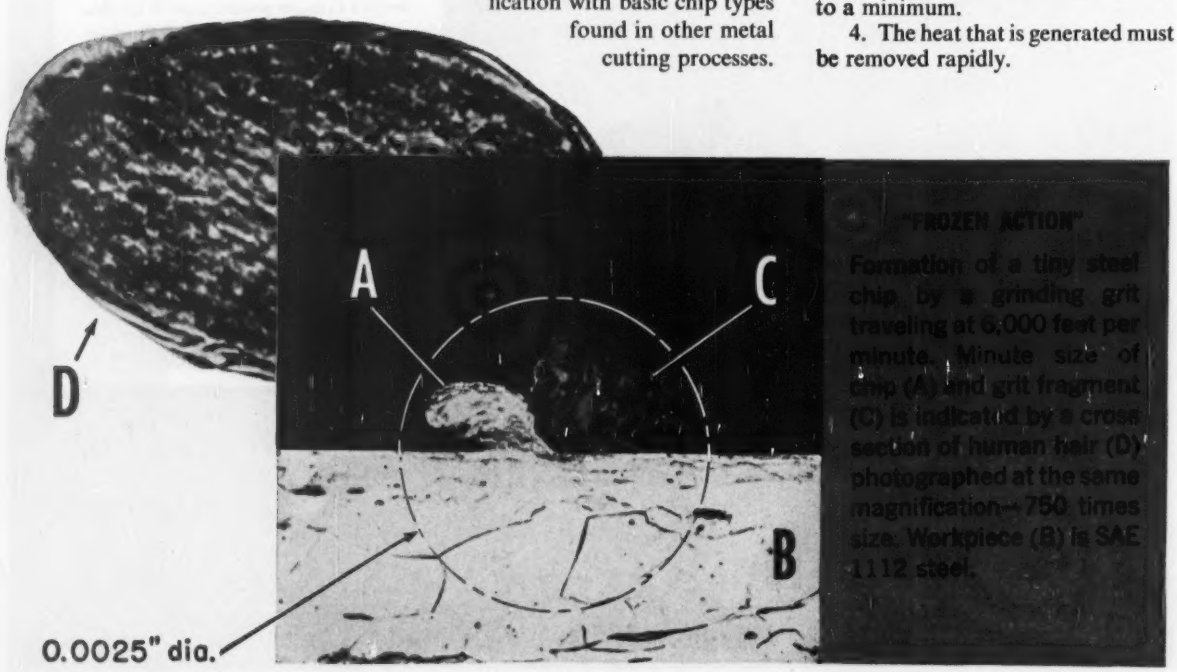
IN CHIP FORMATION LED TO THE NEW

CINCINNATI GRINDING WHEELS

In more than a quarter century of research, it has become increasingly apparent that the grinding process is a true metal cutting process. Cincinnati Milling research has proved that the grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with basic chip types found in other metal cutting processes.

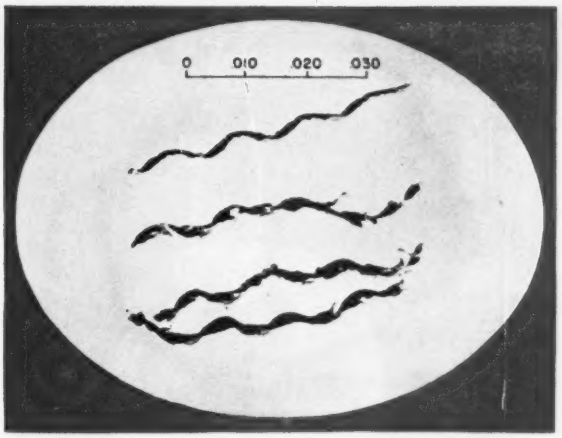
The essential factors involved in this vitally important matter of good chip formation are:

1. The tool must be well supported and properly presented to the work.
2. The chip must slide freely up the face of the tool.
3. Heat generated must be kept to a minimum.
4. The heat that is generated must be removed rapidly.

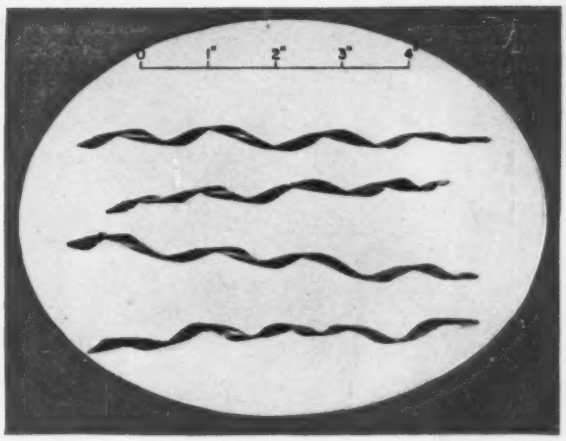


"FROZEN ACTION"

Formation of a tiny steel chip by a grinding grit traveling at 6,000 feet per minute. Minute size of chip (A) and grit fragment (C) is indicated by a cross section of human hair (D) photographed at the same magnification—750 times size. Workpiece (B) is SAE 1112 steel.



Type 2 chips obtained from grinding operation on SAE 1112 steel, selected to indicate the free chip formation possible.



Type 2 chips obtained from helical milling operation on SAE 1112 steel. Note similarity in shape to the grinding chips.

Cincinnati Grinding Wheels stem from a frank recognition of these basic facts.

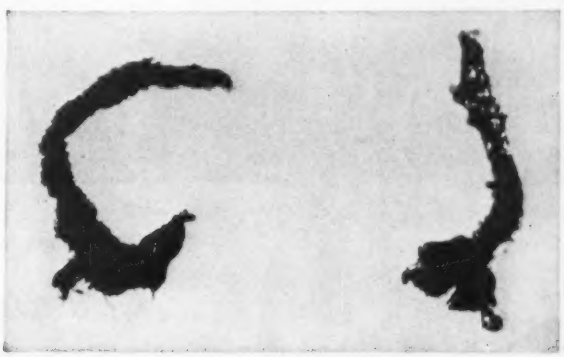
This is the beginning of a whole new approach to grinding wheels—the development of the grinding wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, just write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.

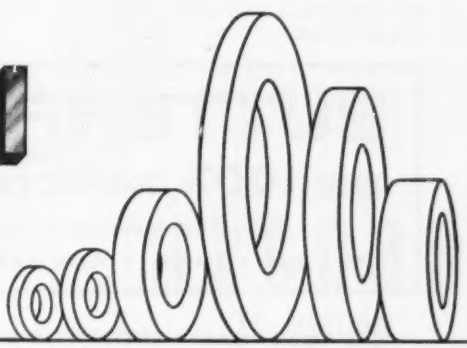


Type 1 chips obtained from grinding operation on cast iron. Typically discontinuous or segmental.



Type 3 chips obtained from slow speed grinding operation on SAE 1112 steel—continuous with built-up edge.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio





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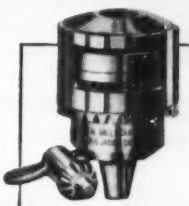


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machine faster with continuous broaching



• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Cutting tool maintenance costs are low. We will be glad to make our recommendations on Footburt Surface Broaching Machines based on our many years in handling similar work.

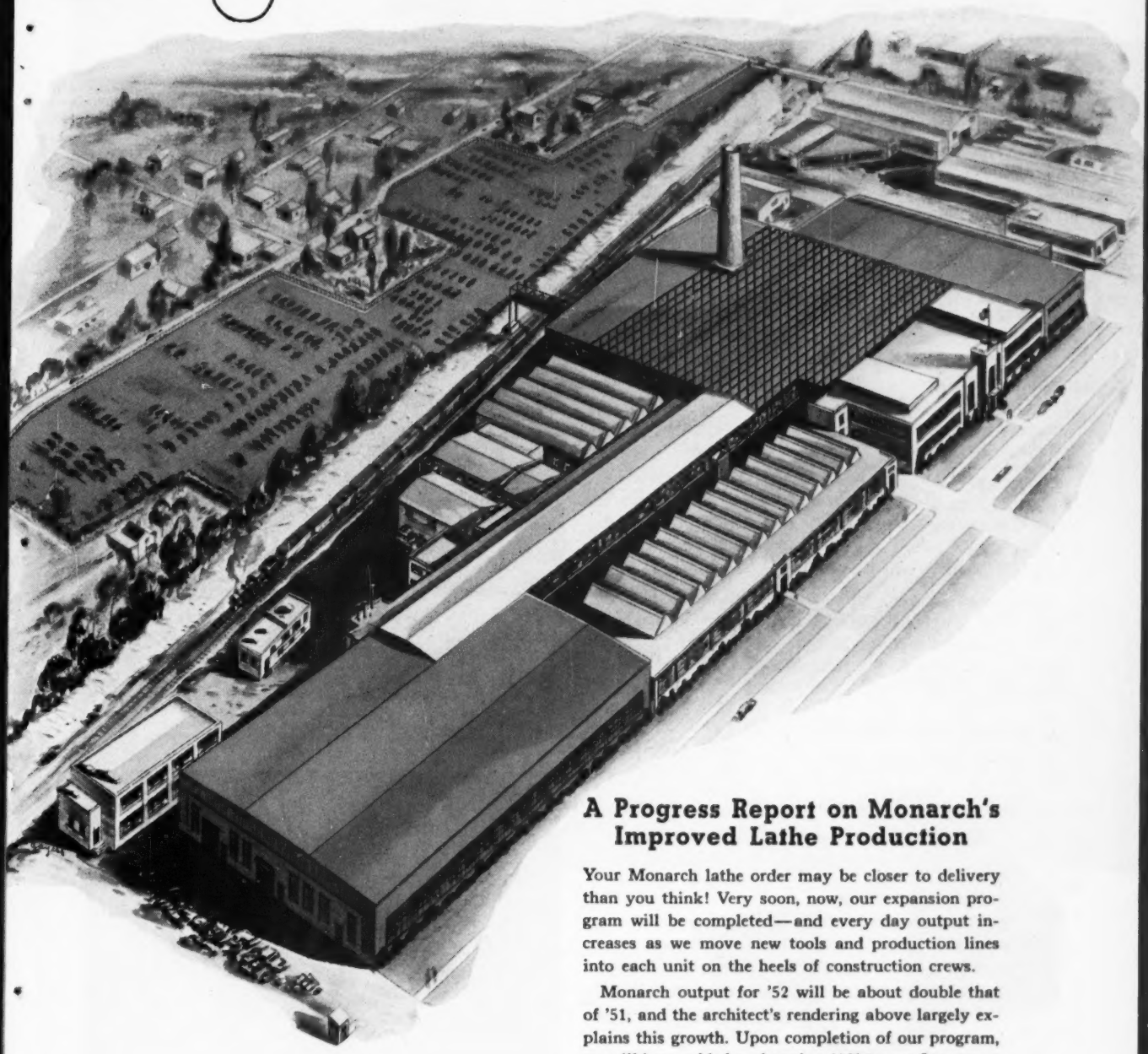
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FOOTBURT

machine tools

The New Day's Dawning!



Plant Expansion Plant Modernization

A Progress Report on Monarch's Improved Lathe Production

Your Monarch lathe order may be closer to delivery than you think! Very soon, now, our expansion program will be completed—and every day output increases as we move new tools and production lines into each unit on the heels of construction crews.

Monarch output for '52 will be about double that of '51, and the architect's rendering above largely explains this growth. Upon completion of our program, we will have added a whopping 43% to our floor space since the close of World War II, and completely modernized the 25% requiring it. Tool and equipment additions, of course, are in proportion. With a completely modernized plant plus this great an increase in floor space, you can see why we're confident of cutting into our backlog fast.

Every day, we're better able to handle new orders and to move faster on present orders—and there'll be continuous improvement with each day's operation. So hang on to your precious priority order. Let us have your new orders. Your new Monarchs are getting a lot closer than they were. . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
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TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

HOLDING A CLOUD-BUSTER'S BREATH



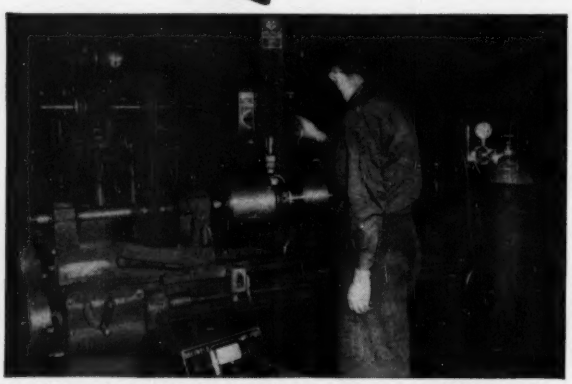
Low pressure breathing oxygen cylinders must be perfect . . . there are no re-fills at 40,000 feet.

Many things can happen at 40,000-plus. But today's precision-trained sound-busters can usually handle them all. But let their vital oxygen supply go wrong and in a matter of seconds there is nothing that can be done.

To meet rigid service specifications, D. K. Manufacturing used Thor-Tung electrodes and Heliwelding. Using both the manual, water-cooled Heliweld holder for welding spuds into position, and the Heliweld Automatic Head for production line runs while welding cylinder halves, D. K. turns out breathing oxygen cylinders which test a leak-free 700 psi – hundreds of pounds above working pressure requirements.

Inert gas-shielded Heliwelding eliminates the need for flux . . . prevents slag formation—permitting 'clear view' operation. Its gas-shielded electrode provides a highly concentrated arc . . . permitting exceptional welding speeds with a minimum of distortion.

Production-running these oxygen lifesavers is just one of the countless jobs Heliwelding can do in your plant or shop. Find out how it can be used for you. Write . . . or phone your nearest Airco Office. Ask for your copy of ADC-709: "Heliwelding—Catalog 9".



Manufactured by the D. K. Manufacturing Company, Chicago, Illinois, breathing oxygen cylinders like those above must be the products of perfect welding. To insure perfection on a production-run basis D. K. uses Heliwelding for their construction.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT



Completed Breathing oxygen cylinders.



Companion-piece of the Heliweld Automatic Head, this jig-mounted manual, water-cooled Heliweld Holder fastens outlet spuds at the rate of nearly two hundred a day to begin the production run of oxygen breathing cylinders for D. K. Manufacturing Co.

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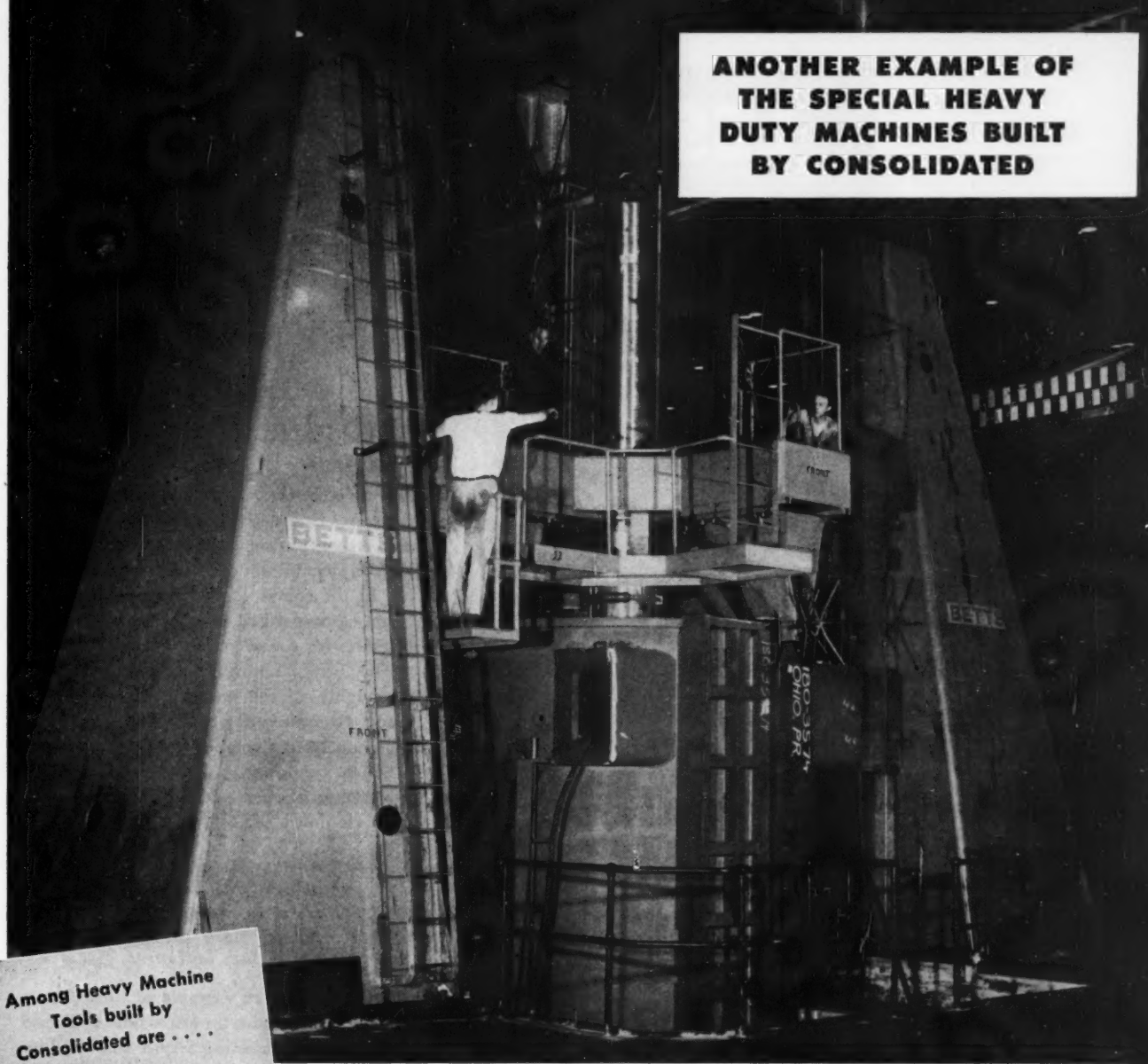
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BETTS SPECIAL VERTICAL BORING AND FACING MACHINE

Built for one of the larger electrical companies and used for boring and facing heavy welded steel generator stator frames from a vertical position, this unusual machine eliminates the inaccuracies heretofore present in such operation performed horizontally and, at the same time, reduces boring time by approximately two-thirds. It may also be used for drilling rib sections and milling spring assemblies. This machine is 36'-6" high, 13'-0" of which is below the floor level. Weight approximately 190,000 pounds. The boring bar is 22" in diameter and 36'-0" long.

Among Heavy Machine Tools built by Consolidated are . . . .

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BORING MILLS
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AND OTHER SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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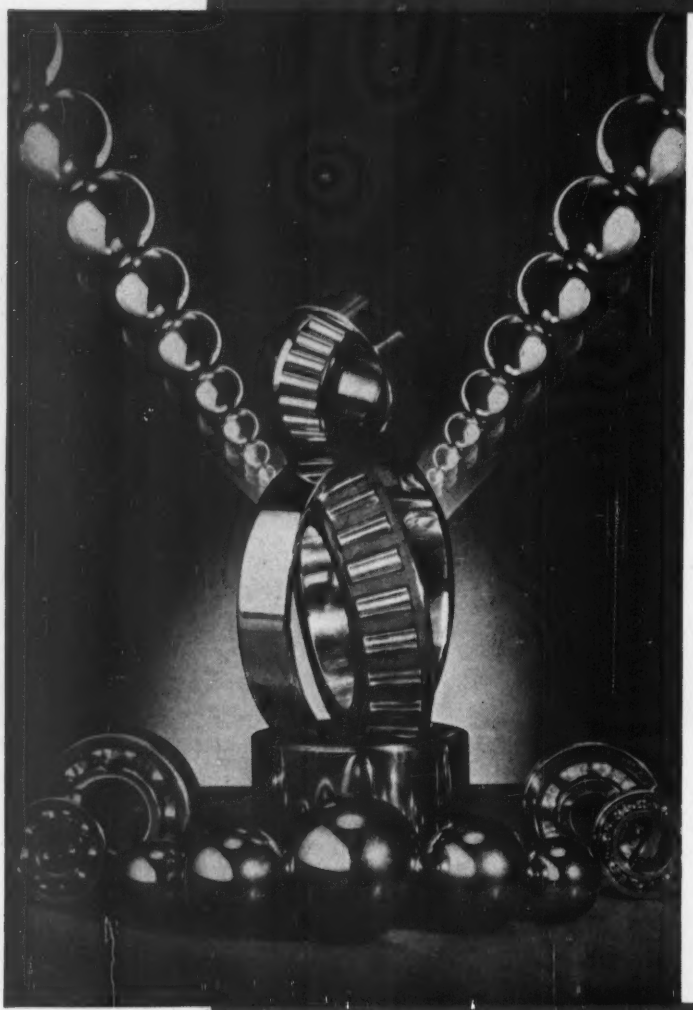
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for Hoover Ball and Bearing Company



As one of America's leading bearing manufacturers, Hoover Ball & Bearing Company, Ann Arbor, Michigan, is always searching for ways to step up production and improve quality. In the course of this never-ending program, Hoover called in a Texaco Lubrication Engineer for consultation.

The Texaco Lubrication Engineer studied thoroughly all the problems involved, then made recommendations which included changing from a competitive grinding oil to a 1-to-50 emulsion of *Texaco Soluble Oil D.* The change was made. Now production is up, costs are down because, with Texaco –

- *machines stay clean*
- *grinding finish has improved*
- *there is no rusting*
- *emulsion filters properly, does not separate, lasts far longer*

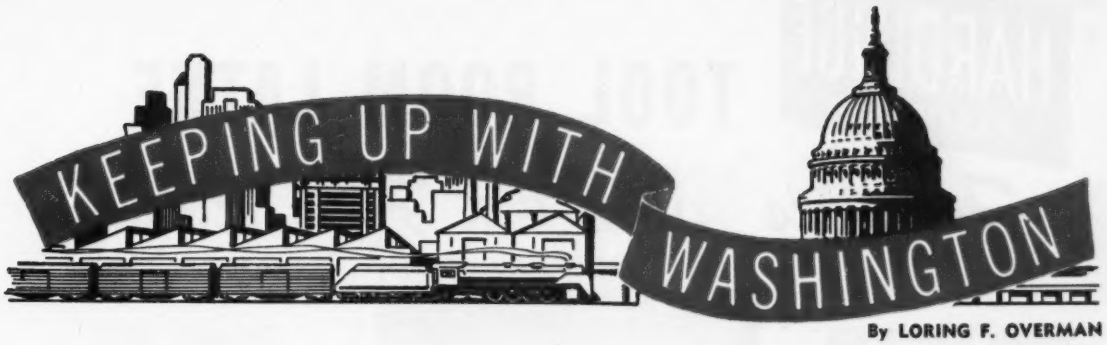
Here again is an example of how Texaco quality products plus the know-how of Texaco Lubrication Engineering Service enable all industry to do its machining better, faster, and at lower cost.

To enjoy these benefits in your plant . . . whatever you are making, wherever located . . . just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Faithfully yours 50 *for Fifty Years*

TUNE IN: On television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.



By LORING F. OVERMAN

Machine Tools No Longer the "Whipping Boy" in Government Circles

THE machine tool industry, long the "whipping boy" of the defense program, has been replaced by another scapegoat. The switch is the outcome of the steel dispute, for when the effects of the strike were totaled, past shortcomings of the machine tool industry had the importance of drops in the bucket by comparison.

Until late July, official Washington soft-pedaled probable effects of the steel stoppage. The public was led to believe that the strike could end any day, and that production losses would not be particularly serious anyway. This conclusion was based on the assumption that defense industries were all working on rather generous inventories. Unfortunately, inventories were not balanced. Many manufacturers reported a forty-five-day inventory of one type of steel, a thirty-day supply of another, and perhaps only a five-day supply for a third type. In some instances, the inventory of Type 3 determined how much of the other types could be put into production.

Some indication of just how serious things were in steel was revealed by Defense Secretary Robert A. Lovett. He estimated that 1952 expenditures for defense items actually delivered would be down by from $2,500,000,000 to $5,000,000,000.

At the present high production rate of the machine tool industry, some factories are on the lookout for new customers. With the easing order book in mind, Defense Production Administration folks are ready with a revision of Regulation M-41, to permit shipment of machine tools on unrated orders. The requirement that shipments be made only on rated orders has become particularly irksome to machine tool builders with stocks on hand, especially since customers are looking to foreign suppliers because of their own inability to tender a rated order.

MEANWHILE, despite some easing in the pressure for deliveries to defense and defense-related contractors, DPA continues to call for further expansion of facilities to produce machine tools and allied equipment. As announced on July 22, the goals call for a $250,000,000 capital investment in added production capacity during the next eighteen months for machine tools, presses, and forging equipment.

The goals in terms of dollar value of added capital investment, together with the completion dates, are given in the table below.

With the establishment of the interim goals tabulated (to be revised in case of changes in military or supporting programs) the DPA Office of Construction and Resources Expansion is now provided with a basis for issuing tax amortization certificates.

ALTHOUGH the machine tool industry could be declared an exception, DPA is now considering the subject of plant dispersion as a prerequisite to the granting of tax amortization certificates. Henry H. Fowler, DPA Administrator, has announced that, in the future, DPA will require the site recommendation of local industrial dispersion groups. The recommendation should accompany "must" applications for tax amortization certificates.

The new form must be used for applications for tax amortization (1) if the proposed facility is to cost $1,000,000 or more, or (2) if the facility, when completed, will produce 15 per cent or more of the national total of the defense-supporting product involved.

The idea of plant dispersion, of course, is to discourage further concentration of industries in well-defined target areas. It is hoped that making dispersion a requirement for tax amortization certificates may provide the added inducement necessary to send industry out to the wide open spaces or underground.

TO keep an official eye on production equipment needs, Dr. John R. Steelman, Acting Director of the Office of Defense Mobilization, has announced the completion of an Advisory Committee on Production Equipment. The group is studying ways and means to achieve the mobilization base and keep it up to date. The chairman of the Committee is Harold S. Vance, president and chairman of the board of the Studebaker Corporation.

CANADA, Great Britain, and the United States have agreed to a permanent organization to devise uniform engineering standards. Permanent committees have been named to consider drafting standards and practices, screw threads, pipe threads, fittings for gas cylinders, fits, and tolerances. Agreements reached on drafting practices were considered as particularly important because they make drawings mutually understandable and result in the saving of manpower hours. The permanent committees appointed are to meet again on October 14, under the direction of the Office of Defense Mobilization.

Product of Plant	Capital Investment in Added Capacity	To Be Completed
Machine Tools	$125,000,000	January 1, 1954
Presses and Forging Equipment	28,000,000	January 1, 1954
Metal-Cutting Tools	30,000,000	July 1, 1953
Dies, Jigs and Fixtures	33,000,000	January 1, 1954
Abrasive Products	34,000,000	July 1, 1953

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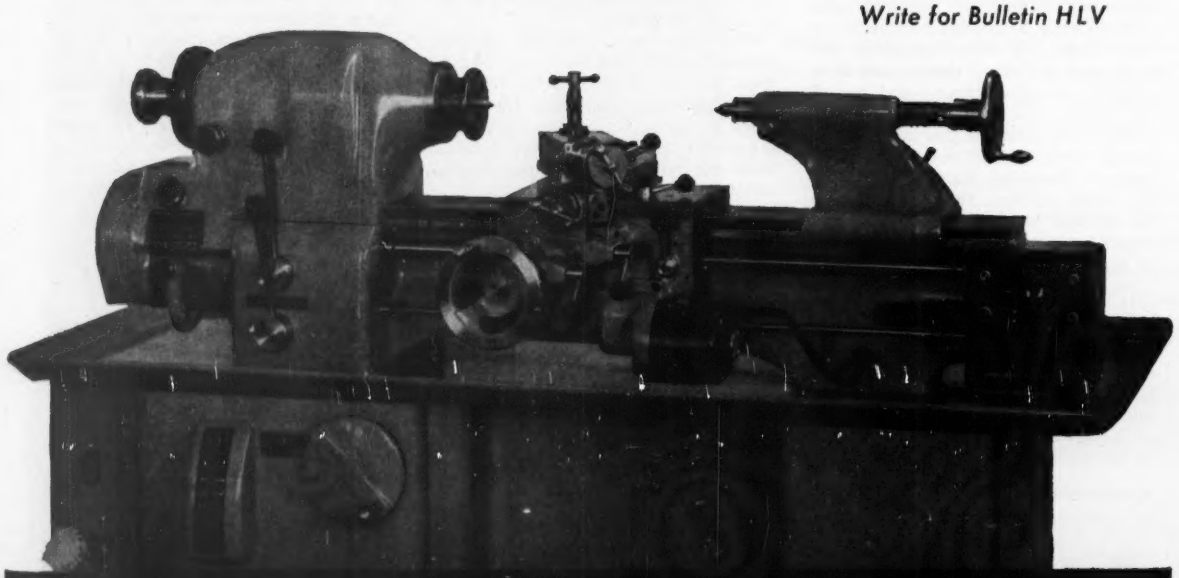


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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

MACHINERY
SEPTEMBER 1952

Apprentices Safeguard the Future of Industry

IN these days of intensified productivity, with automatic machinery tended by semi-skilled or unskilled help, sight is often lost of the fact that successful operation of an industrial plant is possible mainly because of the skillful mechanics who originally built the machines and made the tools, and the trained personnel who keep them in working order. Highly accurate machines and tools can be produced only by men with years of experience as diemakers, toolmakers, or all-around machinists.

Where will these skilled men come from in the future to meet the demands of industry? In shops from the Atlantic to the Pacific the best toolmakers and diemakers are generally old-timers and, to a large extent, either Germans or Swedes who migrated to this country years ago. Men of these nationalities do not necessarily make better mechanics than Americans. When they are more skilled, it is because they were given a more thorough training in shop work during their apprentice days than most Americans received. Even today, apprenticeship training is far more successful in central Europe, despite the economic upheavals of the war.

Unless apprenticeship systems can be made attractive to our youth, industry may find itself in dire straits for skilled help in the years ahead. There are not nearly enough plants with established apprenticeship courses to meet future requirements of industry. In a recent survey, 4300 letters were mailed to metalworking plants inquiring whether those plants were engaged in training apprentices. Seventeen hundred replies were received, of which only 712 specified that their plants sponsor apprenticeship training programs.

Industry is not entirely to blame for this situation, because the problems of maintaining apprenticeship systems are manifold. In the first place, it is extremely difficult to keep young men interested in completing apprenticeships when their friends of similar age are getting much higher wages operating machines which they have learned to run in a day or two. In the second place, local union officials sometimes set up onerous restrictions that discourage businessmen. Finally, after a boy has partially completed his course he is likely to be drafted into the armed services. The chances are strong that he will not again take up the course when he is discharged from military duties because he will be several years older, perhaps married, and in need of a bigger income than apprentices customarily receive.

Industry, labor, and the Government should give this matter serious consideration with a view to solving difficulties on the managerial level. Apprentice wages should be set as high as possible with a view to future benefits to industry rather than to immediate returns. Then campaigns should be conducted to convince boys that pecuniary sacrifices during their period of youth will pay big dividends at a mature age. Stress should be laid on the fact that many important industrial leaders started their careers on the work-bench.

Times have changed, but the man skilled in a trade or profession is still the man most likely to succeed.

Charles O. Herb

EDITOR



Cold water strikes red hot metal in end-quench hardenability test—first step in Ryerson quality control.

RED HOT REASON for Buying Ryerson Alloys

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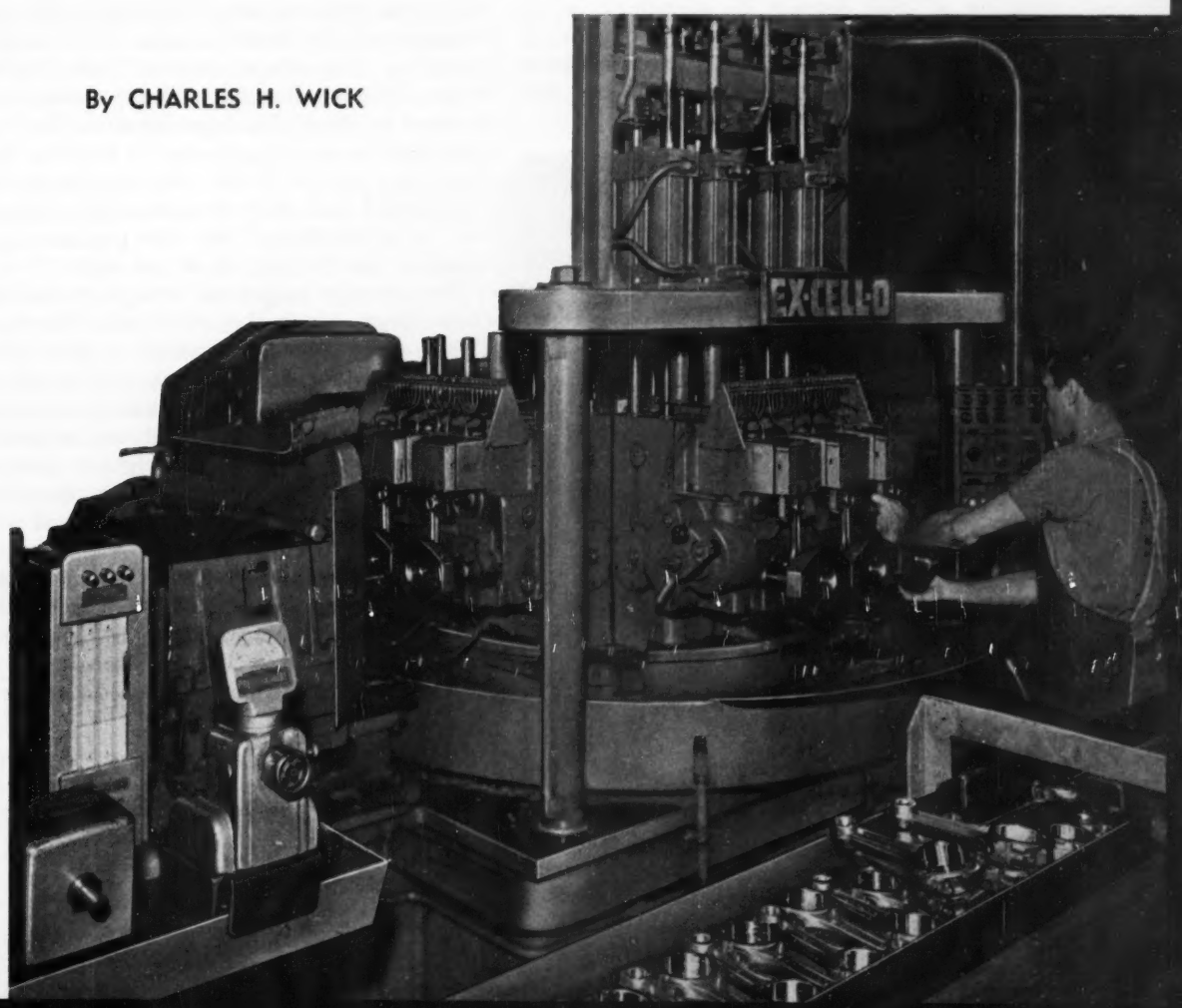
Vol. 59, No. 1 MACHINERY September, 1952

Ford's Improved Methods of Manufacturing Connecting-Rods

IN building the new overhead valve, six-cylinder engine at the Cleveland Engine Plant of the Ford Motor Co., many improved manufacturing techniques have been applied, and work-handling has been reduced to a minimum by automation. One unique method permits connecting-rod and cap forgings having a wider weight variation to be employed. With this method, a far greater number of parts can be obtained from the forging dies, and the need for matching of connecting-rod assemblies for each engine is eliminated. Now, any connecting-rod forging can be assembled to any cap, and finish-machined within the required weight limits. As a result, 100 per cent interchangeability of connecting-rod assemblies is attained.

Permissible variation in weight of connecting-rod forgings has been established as 56 grams (varying from 770 to 826 grams), while the allowable difference in weight of the forged cap is 28 grams over the basic or low-weight cap forging (from 319 to 347 grams). Automatic weighing scales are provided right in the production line to prevent forgings below the basic

By CHARLES H. WICK



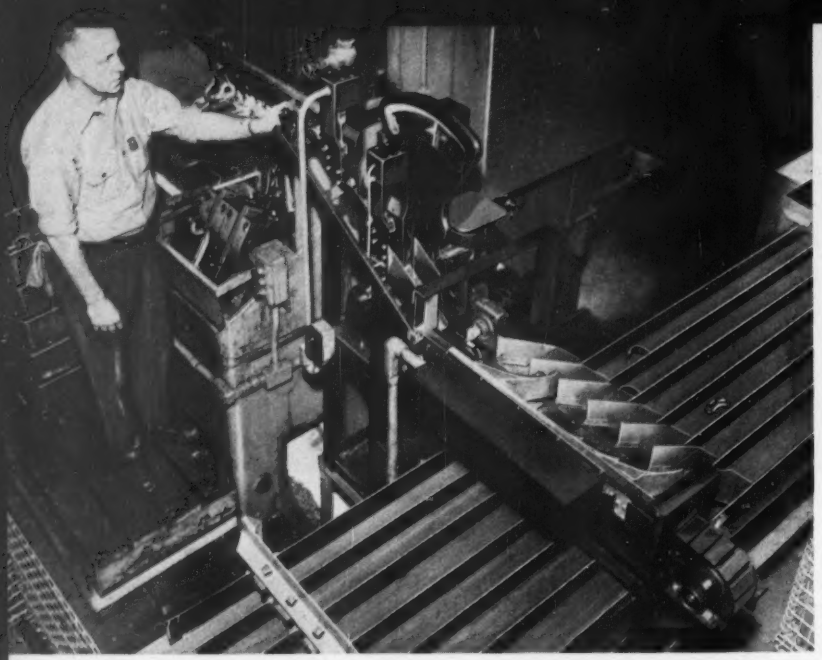


Fig. 1. An automatic, electrically controlled weight-sorting scale rejects underweight and overweight connecting-rod caps, and separates the remainder into four weight classifications.

weight and those over the weight limits from being machined, and, secondly, to sort the rods and caps into six and four working-weight categories, respectively.

Connecting-rod caps are forged, six at a time, from hot-rolled S A E 1041 steel. A Brinell hardness of about 236 is obtained prior to machining by heating the forgings to a temperature of 1500 degrees F., quenching in oil (maintained at about 90 degrees F.), removing the forgings from the oil quench when they have reached a temperature between 250 and 600 degrees F., and then drawing at about 1050 degrees F. The multiple forgings are shot-blasted, cleaned, and then cut apart to form individual rough caps.

A Lapointe 10-ton, 42-inch stroke, double-ram vertical broaching machine is employed to rough- and semi-finish-broach the forged caps to a width between 1.264 and 1.267 inches. Two parts are broached at a time, and two more forgings can be loaded during the broaching operation. The caps are located from their bolt bosses for centralization, and are automatically clamped in the tilting type fixtures. The high-speed steel broach inserts are fed past the work-pieces at a cutting speed of 33 feet per minute. About 0.035 inch of stock is broached from each side. A production of 760 caps per hour is obtained at an efficiency of 80 per cent.

The operator places the broached caps on a chute, from which they slide into the special Toledo six-station, automatic weight-sorting scale shown in Fig. 1. A Rythmizer attachment agitates the parts to prevent them from choking the entry to the scale. As each cap is weighed, a gate corresponding to the weight is automatically swung into the path of the cap, thus directing it onto the proper divided portion of a belt conveyor.

The conveyor belt is separated by metal partitions into six sections. Caps weighing less than the basic or minimum standard (319 grams) fall onto that part of the conveyor seen at the left, while caps weighing more than 347 grams are

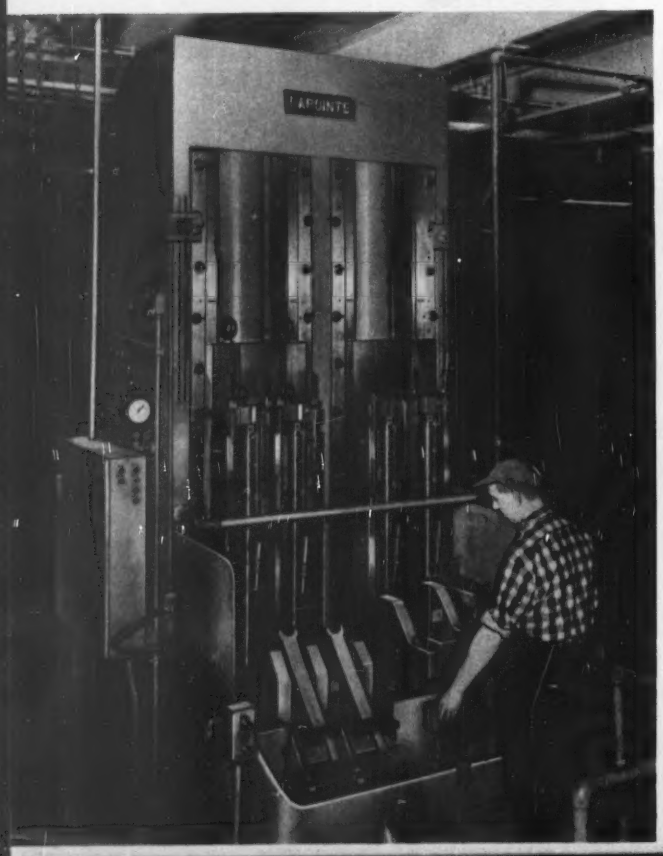


Fig. 2. Joint faces, half-bores, and width over the bolt bosses on connecting-rod caps are all broached simultaneously on this 15-ton, 66-inch stroke vertical machine.

ejected onto the right-hand side of the conveyor. The other four sections of the conveyor, from left to right, carry caps weighing from 319 to 326, 326.1 to 333.1, 333.2 to 340.2, and 340.3 to 347 grams. Caps from each section of the conveyor fall into individual stock boxes. Underweight caps are scrapped, overweight caps are sent to a special repair department, and boxes containing caps in the four weight classifications are transferred to the Lapointe 15-ton, 66-inch stroke, double-ram vertical broaching machine shown in Fig. 2.

On this machine, the joint faces, half-bores or bearing radii, and width over the bolt bosses are all broached simultaneously. Since the machine has a dual ram, one of the two-station fixtures can be unloaded and reloaded while two caps are being broached. Automatic clamping is obtained by means of the hydraulically actuated tilting fixtures. Stock removal, cutting speed, and production are about the same as for the previous broaching operation.

The positions of the fixtures with relation to the rams on this broaching machine are adjustable to accommodate caps in the various weight classifications. For example, when broaching the heavier connecting-rod caps, the fixtures are moved closer to the rams and broaching tools. Since each stock box contains approximatelv 4000 caps of one specific weight classification, the operator can complete an eight-hour production run before adjustment of the fixtures is required to handle some other weight group. With this set-up, all of the broached caps are approximately equal in weight. A scale is provided at each broaching machine to check the weight of any new batch.

Broached caps are removed from the fixture and placed in a chute leading to the Davis & Thompson eight-station, rotary indexing machine shown in Fig. 3. Here a bolt hole is drilled, chamfered, and rough- and finish-reamed in the two bosses of each connecting-rod cap. The machine table, which rotates continuously about the vertical center column, is equipped with eight work-holding fixtures, each fixture holding four caps spaced 90 degrees apart. Every work-piece makes four complete revolutions around the machine, and is indexed through an angle of 90 degrees after each revolution. One part is removed from a fixture after each revolution of the table. The vertical tool-heads rotate about the center axis of the machine with

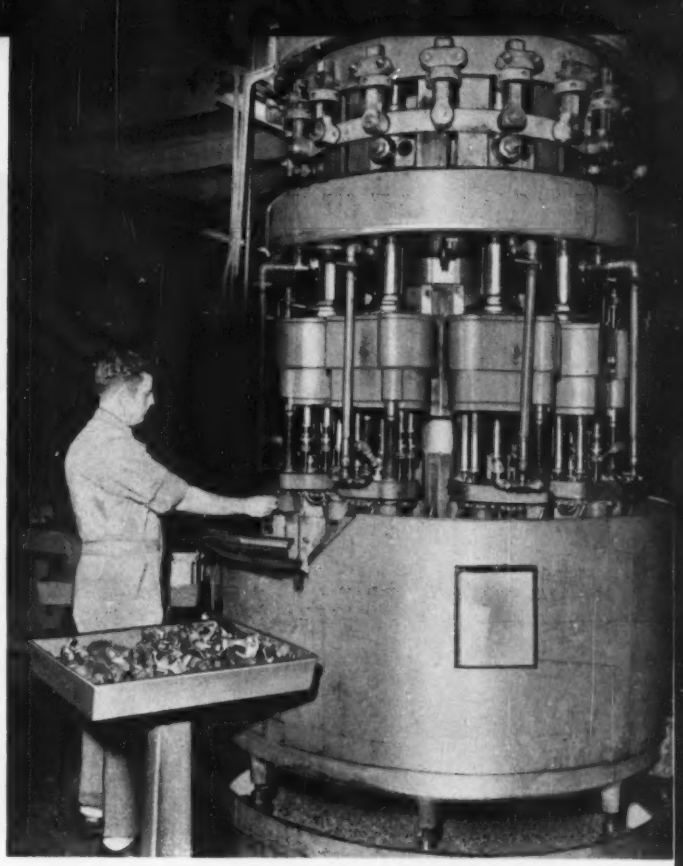


Fig. 3. Bolt holes in connecting-rod caps are drilled, chamfered, and rough- and finish-reamed at the rate of 486 per hour on an eight-station rotary indexing machine.

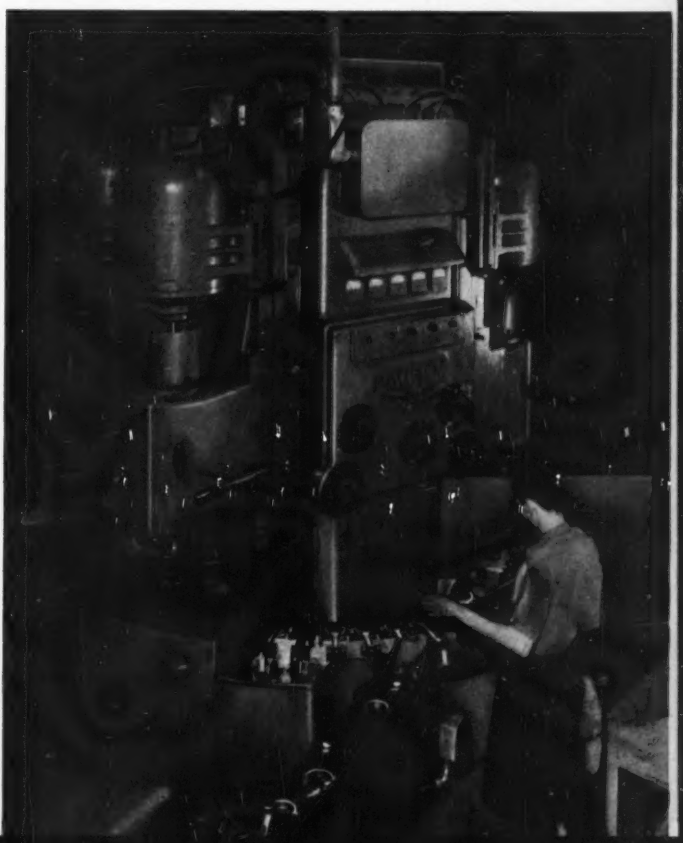


Fig. 4. Both sides of wrist-pin and crank-pin bosses are ground at rate of 560 connecting-rods per hour on this five-wheel, vertical-spindle surface grinding machine.

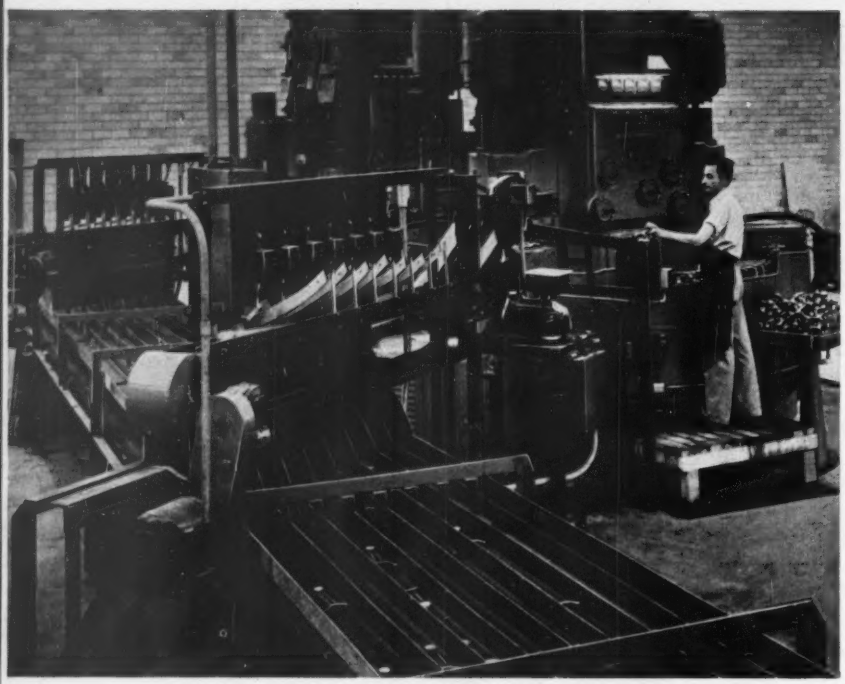


Fig. 5. Connecting-rods are separated into six different weight classifications, and underweight and overweight rods are rejected on this automatic eight-station weight-sorting scale.

the work-holding fixtures and table, but are not indexed.

Each of the eight six-spindle tool-heads contains two 11/32-inch diameter drills; two 0.3595-inch diameter combination rough-reaming and chamfering tools; and two 0.3760-inch diameter finishing reamers. A cutting speed of 55 surface feet per minute is employed. Down feed and retraction of the tools are completed in 250 degrees of a complete revolution of the table, allowing an arc of 110 degrees for unloading and reloading one part in each fixture. The caps are located from their previously broached half-bores and sides, and are automatically clamped against their joint faces. A production of 486 caps per hour is obtained at an efficiency of 80 per cent. Bolt-hole size is checked periodically by means of Comtor dial-indicating, expansion plug gages, and the caps are placed on a conveyor.

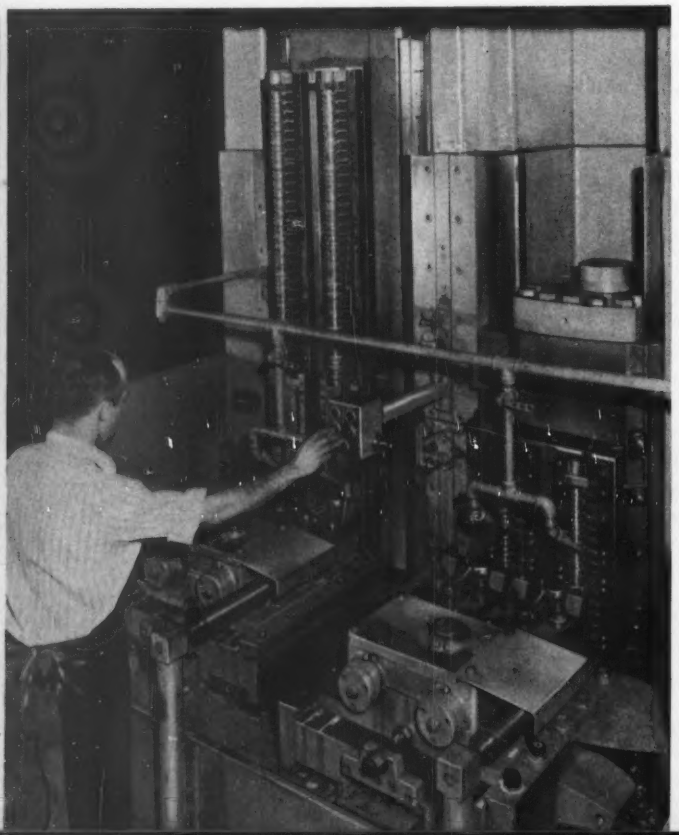


Fig. 6. Broaching half-bores and joint faces of connecting-rods, two at a time. Location of fixtures with relation to broach rams is adjusted for various weight rods.

From the belt conveyor, connecting-rod caps fall into a hopper which pre-positions and feeds them into an automatic magazine loader on a continuous, rotary milling machine. A bearing liner anchor slot, 0.1625 inch wide by 0.28 inch deep, is milled in the half-bore of each cap.

The two bolt-holes in each connecting-rod cap are spot-faced and chamfered on a Davis & Thompson six-station rotary indexing machine similar to the eight-station machine previously described. After washing and drying, the caps are ready to be assembled to the connecting-rods.

Connecting-rods for the new Ford engine are also forged from hot-rolled S A E 1041 steel. A heat-treatment similar to that employed for

the caps produces a Brinell hardness of about 236 prior to machining. Both sides of the wrist-pin and crankpin bosses on the connecting-rods are rough- and semi-finish-ground on the Mattison five-wheel, vertical-spindle surface grinding machine shown in Fig. 4. Each rod must pass through the machine twice, the part being turned upside down before passing through the second time. The rotary table of the grinding machine has forty work-holding fixtures which automatically clamp the connecting-rods as they pass beneath the abrasive wheels.

Aluminum oxide abrasive wheels of 36 grain size and F hardness are employed, and all five wheels are 20 inches in diameter by 5 inches thick. Three of the wheels are mounted so as to grind the crankpin boss, removing about 0.040 inch of stock from each side of the boss, or a total of 0.080 inch, while two wheels remove about 0.030 inch per side from the wrist-pin boss. Of this amount, from 0.006 to 0.008 inch of stock is removed in semi-finish-grinding. The grinding wheels are rotated at a surface speed of 5200 feet per minute, while the table revolves at 8 feet per minute. A production of 560 rods per hour is obtained. Wheel wear is compensated for by automatic downward feed of grinding wheels, controlled by a sizing gage and a separate motor-driven mechanism.

In this operation, the wrist-pin boss is ground to a thickness of 1.3295 inches, ± 0.0005 inch, while the thickness of the crankpin boss is ground within ± 0.0005 inch of the required 1.2645-inch size. Also, the step between the faces of the bosses on either side of the connecting-rod is held to ± 0.0005 inch of the specified 0.0325 inch. Surface-ground connecting-rods are placed on the chain conveyor seen at the bottom center in Fig. 4.

This conveyor carries the connecting-rods to another Toledo automatic weight-sorting scale, Fig. 5. As each connecting-rod is weighed, an electrically operated gate swings into the path of the rod, thus causing the rod to fall onto the proper part of the partitioned conveyor. Connecting-rods weighing less than the minimum standard (770 grams) fall onto the right-hand conveyor section, while rods weighing more than 826 grams are ejected onto that portion of the conveyor seen at the left. The other six partitioned paths on the conveyor carry connecting-rods weighing from 770 to 779.4, 779.5 to 788.8, 788.9 to 798.2, 798.3 to 807.6, 807.7 to 817, and 817.1 to 826 grams. Weight masters are provided for periodic inspection of the sorting scale.

Pallet boxes full of proper weight connecting-rods are transported to the Cincinnati 15-ton, 66-inch stroke, duplex-ram vertical broaching machine shown in Fig. 6. In this operation, the joint faces are semi-finished, and the half-bores are rough-formed to a radius of 1.1715 inches ± 0.0015 inch and a depth of 1.1855 inches ± 0.0025 inch from the joint faces. Shuttle type fixtures — automatically moving toward and away from the rams — are employed, and two connecting-rods are broached while two more are being loaded. About 0.040 inch of stock is removed from each of the three surfaces, a cutting speed of 33 feet per minute being used. Again, the positions of the fixtures with relation to the rams must be adjusted for each group of connecting-rods having a different weight classification. After broaching, all rods weigh approximately the same. The slight variations in weight resulting from the random assembly of rods and caps are corrected when the assemblies are finish-machined and finally balanced.

Wrist-pin holes in the connecting-rods are drilled, chamfered, and reamed on the Baker seven-station indexing, vertical drilling machine seen in Fig. 7. The rotary table of the machine is equipped with seven fixtures, and each fixture holds three work-pieces. All of the tools are mounted on two nine-spindle heads. The parts are located from the ground sides of the wrist-



Fig. 7. This seven-station indexing, vertical drilling machine equipped with two nine-spindle heads is employed to drill, chamfer, and ream wrist-pin holes in the connecting-rods.

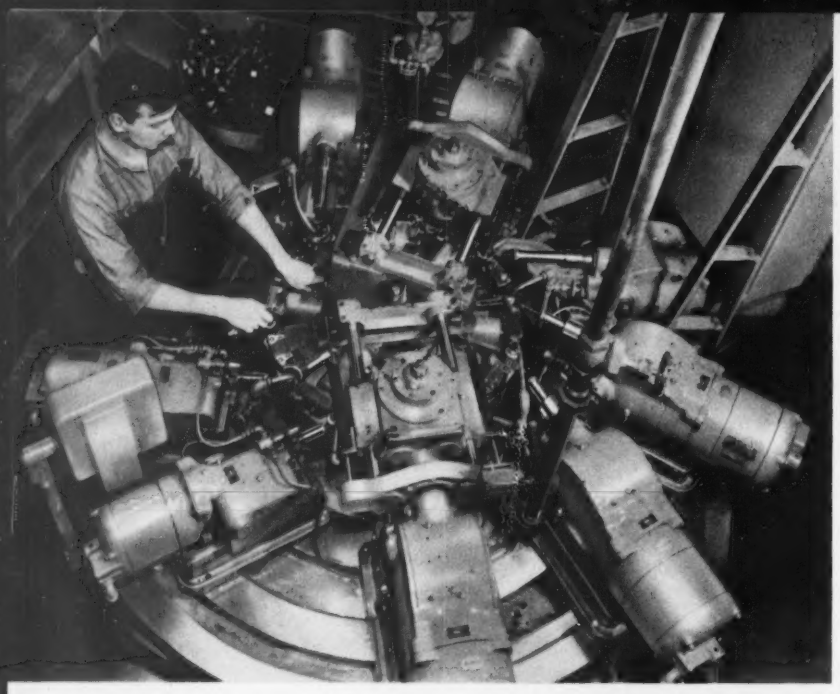


Fig. 8. The bearing liner anchor slots are milled and oil-squirt holes are drilled in the half-bores of connecting-rods on this five-station indexing machine at the rate of 640 rods per hour.

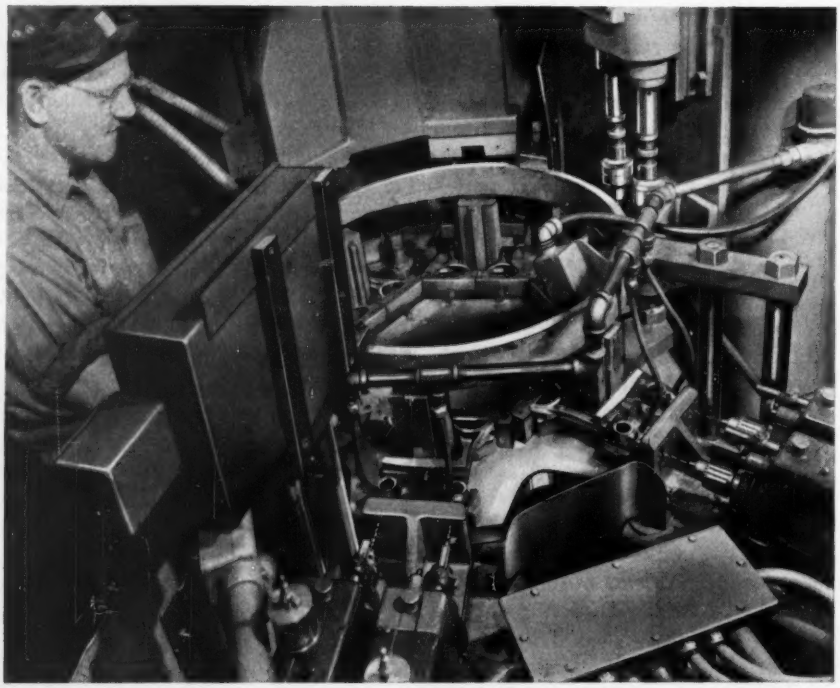


Fig. 9. Split bronze bushings are pressed into the wrist-pin holes, oil-holes are drilled in the connecting-rods, and the bushings are burnished in this unusual automatic machine

pin and crankpin bosses, and against the broached half-bores. Power clamping is controlled by push-button.

After unloading three parts and reloading at the first station, the fixture is indexed to the second station. Here, the three wrist-pin holes are drilled to a diameter of 59/64 inch by 0.47 inch deep. The holes are increased to a depth of 0.72 inch with 29/32-inch diameter drills at the third station. Drills 57/64 inch in diameter are employed at the fourth station to drill the holes through (approximately 1 5/16 inches deep). At the fifth station, the wrist-pin holes are core-drilled through to a diameter of 61/64 inch. This operation is accomplished with tungsten-carbide tipped drills at an accelerated feed rate. Previously, with high-speed steel drills and a slower feed, it had to be done in two steps. Both sides of the holes are chamfered to a diameter of 0.93 inch by 90 degrees included angle at the sixth station. After being indexed to the seventh and final station, the wrist-pin holes are reamed to a diameter of 0.9735 inch, using tungsten-carbide tipped reamers. Pratt & Whitney air comparator gages are employed to check the hole diameters.

A belt conveyor carries the connecting-rods to a Cincinnati 10-ton, duplex-ram vertical broaching machine, where the peripheries of the crankpin ends are broached to a diameter of 3.386 inches ± 0.001 inch. This operation is necessary only for manufacturing purposes, and a production of 830 rods per hour is obtained. Joint faces of the connecting-rods are then semi-finish- and finish-ground to a distance of 6.260 inches from the center of the wrist-pin hole on a Blanchard two-wheel, vertical spindle surface grinding machine. About 0.010 inch of stock is ground from the joint faces with one abrasive wheel, and 0.005 inch more with the second, or finishing, wheel. The production from this machine is 1025 rods per hour. Bolt holes in the connecting-rods are drilled and rough- and finish-reamed on a Davis & Thompson eight-station, rotary indexing machine similar to the one employed for the same operations on the caps and previously described.

From another belt conveyor, the connecting-rods are placed, two at a time, into fixtures on the rotary table of the Kingsbury five-station, indexing machine shown in Fig. 8. The wrist-pin holes in the rods are positioned on pins, the crank ends are nested between locating blocks, and the rods are automatically clamped. As the rods are indexed to successive stations on the machine, bearing liner anchor slots, 0.1625 inch long by 0.06 inch wide and 0.28 inch deep, are milled in their half-bores; a hole 5/32 inch in diameter is drilled to a depth of 3/8 inch in each half-bore in two steps; and then these oil-squirt holes are continued through the walls of the rods with 1/16-inch diameter drills. A production of 640 rods per hour is obtained.

Bolt-head seats, 3/4 inch in diameter, are counterbored on the crankpin ends of the connecting-rods, and edges of the bolt holes, counterbored seats, and oil-squirt holes are chamfered on another Davis & Thompson six-station vertical indexing machine. A total of forty-one tungsten-carbide tipped counterboring tools, end-mills, and deburring cutters are employed. Production per machine is 640 rods per hour, and the parts are automatically ejected onto a conveyor leading to the next operation.

On the unusual Ducto-Matic six-station indexing machine shown in Fig. 9, split bronze bushings are automatically pressed into the wrist-pin ends of the connecting-rods, an oil-hole is drilled through the wrist-pin end of each rod, and the bushings are burnished and chamfered. After removing two completed rods at the first station, two more parts are placed in the fixture, and they are indexed to the second station. Here, split bronze bushings fall from an overhead hopper (not shown) through the two flexible tubes seen at the upper left, into position above the wrist-pin holes in the connecting-rods. Two vertical bushing drivers, equipped with tungsten-carbide wear strips, are automatically lowered to press the bushings into place.

A 3/16-inch diameter oil-hole, approximately 1/2 inch long, is drilled through the wrist-pin ends of the rods in two steps at the third and fourth stations. The burrs produced in the bushing bores are removed, and the bushings are burnished to a diameter of 0.8955 inch at the fifth station. At the sixth and final station, both sides of the bushings are rounded to a radius of 0.035 inch. About 384 rods per hour are completed in this set-up.

The caps are automatically assembled to the rods on an unusual automatic machine made



Fig. 10. A four-spindle, eight-station machine is employed to semi-finish-bore crankpin holes in the connecting-rod assemblies, four at a time. A tolerance of ±0.0007 inch is maintained.



Fig. 11. Each end of the connecting-rod assembly is individually weighed on the scale seen at the right, and the opposed milling heads are automatically set to remove required amount of metal.

by the Aviation Tool & Engineering Co. All that is necessary is for the operator to place the rods in the fixtures, and keep the two hoppers filled with bolts and nuts and a magazine filled with rod caps. An arm automatically moves into position in the hopper chute to receive four bolts, and returns to line up the bolts with holes in two rods. A press ram moves forward to press the bolts into the rods, and caps fed from the magazine are pressed over the bolts and against the joint faces of the rods. Then, nut-setters, carrying four nuts from the other hopper, drive the nuts onto the bolts with torque controlled at 50 foot-pounds. This cycle is automatically repeated to completely assemble 1100 connecting-rods per hour.

Crankpin holes in the connecting-rod assemblies are semi-finish-bored on the Kreuger four-spindle, eight-station angular boring machine shown in Fig. 10. Four rods are bored while four more are being loaded in the automatic clamping, shuttle type fixture. The carbide-tipped tools are rotated at a cutting speed of 320 feet per minute, and fed through the bore at the rate of 0.009 inch per revolution to remove about 0.030 inch of stock. A tolerance of ± 0.0007 inch is maintained on the 2.4022-inch diameter crankpin hole, and a production of 600 assemblies per hour is obtained. By semi-finish-boring the crankpin holes, more tolerance can be allowed and higher production obtained in broaching the rod and cap half-bores.

Weight of the interchangeable connecting-rod assemblies is maintained within ± 2 grams at the crank end and within ± 5 grams at the pin end by means of the Motch & Merryweather automatic balancing and milling machine shown in Fig. 11. A special Toledo scale, seen at the right, is designed to weigh each end of the rod assembly simultaneously about a fixed center of gravity and independently of the opposite end. The amount that each end of the rod is overweight is transmitted by means of selsyns to the milling machine, the duplex milling cutters of which are automatically set to remove the required amount of stock from each end when the connecting-rod assembly is transferred to the fixture on the machine.

The work-piece is positioned in the fixture on two locating pins and automatically clamped by hydraulic actuation. Locating probes, which can be seen directly in front of each milling cutter, stop the inward movement of the heads when they contact the weight-compensating pads forged on each end of the rod. The special quill type milling spindles continue moving inward the required amount, and then the slides are traversed to mill stock from both pads. Inserted type milling cutters, each having twenty tungsten-carbide blades, are employed. The operator places an assembly on the scale while the previous one is being milled, and 192 assemblies are completed per hour on each machine.

One of the most important operations—since the parallelism of the connecting-rod assembly depends upon it—is that of semi-finish- and finish-grinding the crank-end boss to a thickness of 1.2445 inches, and the pin-end boss to a thickness of 1.3085 inches. Both thicknesses, and the 0.0320-inch step between the faces of the bosses, are held to ± 0.0005 inch. These operations are performed on a Blanchard three-

wheel, vertical-spindle surface grinding machine. Each assembly must pass through the machine twice, and is turned over between passes. Speeds, stock removal, and type of abrasive wheels employed are the same as for the similar operation, previously described, on the connecting-rods.

The crank-end and wrist-pin holes are finish-bored, and both sides of the crank-end hole are chamfered on the special Ex-Cell-O three-way, four-station automatic indexing machine shown in the heading illustration. The connecting-rod assemblies are loaded, three at a time, at the first station, being located over retracting plugs that enter the crank-end and wrist-pin holes, and are automatically clamped. When the parts have been indexed to the second station, the locating plugs in the crank-end holes are retracted and these holes are bored to a diameter of 2.4215 inches ± 0.0010 inch. At the third station, the locating plugs re-enter the bored crank-end holes and those in the wrist-pin holes are retracted. The latter holes are then bored to a diameter between 0.9122 and 0.9125 inch —a total tolerance of only 0.0003 inch. Both sides of the crank-end holes are chamfered at the fourth station.

Carbide-tipped tools are employed at all three machining stations. For boring the steel crank-end holes, the tools operate at a cutting speed of 250 feet per minute and are fed at the rate of 0.007 inch per revolution. On the bronze bushings in the wrist-pin holes, however, the tools rotate at a cutting speed of 900 feet per minute and are fed 0.002 inch per revolution. A production of 552 connecting-rod assemblies per hour is obtained from each machine. A Sheffield dial type Precisionaire gage is used to inspect the crank-end holes, while a three-column Precisionaire gage, seen at the left in the illustration, checks the wrist-pin holes.

As the final operation, the crank-end bore is honed to a diameter of 2.4234 inches ± 0.0004 inch. This is accomplished on the Micromatic six-spindle, vertical, rotary type honing machine shown in Fig. 12. Called the "Turret-Hone," this high-production machine has a table that rotates continuously. The operator places the rods into the six fixtures, one at a time, as they pass the loading station. As the fixtures are hydraulically lifted into honing position, the tools enter the bores and are expanded at a preset rate. When the bore reaches the required size, expansion of the honing tool is automatically stopped. After a short dwell period, the honing tool automatically collapses and stops rotating, and the fixture is lowered into the unloading position. Total stock removal is about 0.002 inch, and approximately 670 connecting-rod assemblies are completed per hour.

After washing and drying, the assemblies are given a final inspection. This includes checking the wrist-pin bore size and taper, the crank bore size, parallelism and center distance between the bores, squareness of the crank bore with the face, and weight of the assembly. The bores must be in the same plane within 0.0015 inch per inch, and parallel within 0.0005 inch per inch.

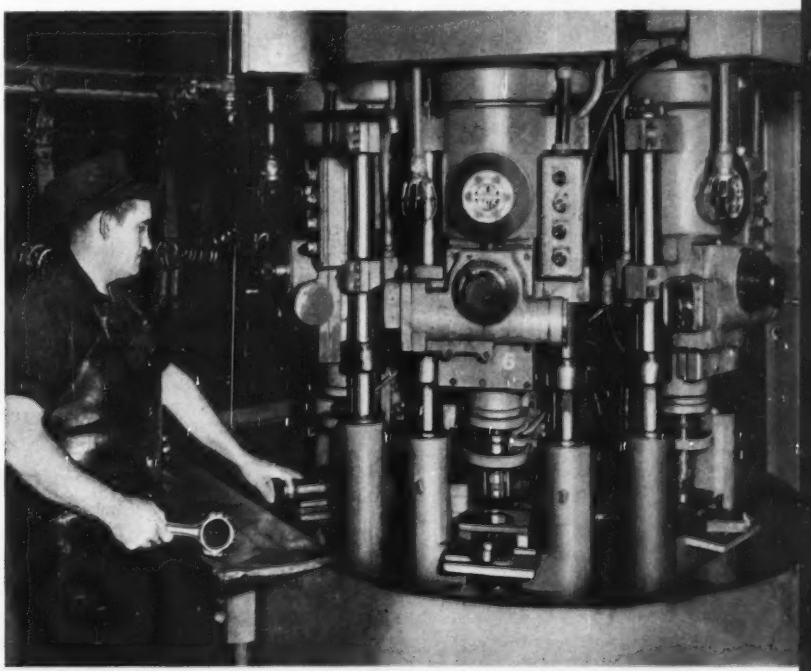


Fig. 12. Crank-end bores of the connecting-rod assemblies are honed to size within ±0.0004 inch on this six-spindle rotary honing machine at the rate of 670 per hour.

Lubrication of Anti-Friction

LUBRICANTS are the "life blood" of anti-friction bearings. When properly selected and applied, they serve to (1) minimize friction between the rolling elements and the races and retainers of the bearing; (2) protect the hardened and highly finished internal steel surfaces of the bearing from corrosive action; (3) carry heat away from the bearing; and (4) aid in preventing the entry of foreign matter into the bearing.

Grease versus Oil

Either oil or grease is used for lubricating both ball and roller bearings, the selection depending on the operating conditions involved. In some applications, either one can be used with equal effectiveness, whereas in other applications one type of lubricant is definitely indicated. As a rule, bearings for shafts running below 500 R.P.M. are lubricated with grease or grease products, and bearings for shafts running above that speed are lubricated with oil. It is difficult to lay down rigid specifications for oils and greases used with ball and roller bearings. Several factors must be considered before selecting the ideal lubricant for any given conditions of service, and sometimes the decision between using oil or grease is not an easy one to make.

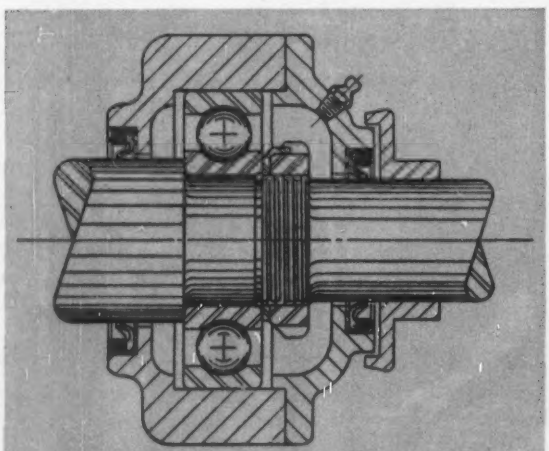


Fig. 1. The seals of this bearing are assembled so that their lips point outward, thereby serving as pressure-relief valves.

The anti-friction bearing manufacturers seemingly prefer oil to grease, yet 75 per cent of the ball and roller bearings in service today are lubricated with grease or grease products. This is because oil is not always the more practical lubricant, and engineers have to compromise on this point. For instance, there is the problem of lubricant retention, which becomes more complicated with oil than with grease because oil has less consistency. The use of oil requires tighter housings, which are obviously more difficult to design than those for grease. However, the problem of lubricant retention around ball or roller bearings has been greatly simplified by the use of unit type leather or synthetic rubber seals.

Another deciding factor in selecting oil or grease is the importance of cleanliness in the immediate area of machines and lineshaft boxes in textile mills, food processing plants, etc. This may often preclude oil, inasmuch as cleanliness can be more easily maintained if the machines and boxes are grease-lubricated. In addition to possible spoilage and contamination, dripping oil can also create a safety hazard. Grease, being stiffer and heavier than oil, is also better able to seal out foreign matter. A further advantage is that during periods of idleness grease is better able to maintain a protective film over the bearing surfaces.

Specifications for Lubricants

Where an oil lubricant has been determined on, high-grade aircraft and automotive oils of the consistency of S A E 20 are generally recommended. Such light-bodied lubricants reduce friction, with an accompanying reduction in power consumption. At the same time, they are effective over a wide range of temperatures. Refined mineral oils used for ball or roller bearings should have the following physical properties: Flash, 375 degrees F., minimum; viscosity, Saybolt universal, 75 seconds at 210 degrees F., minimum; cold test (pour), at 40 degrees F., maximum; and moisture, trace.

Some bearing manufacturers make additional tests before recommending a lubricant. Torque and leakage at various temperatures (—40, —67, 80, 150, and 220 degrees F.) are determined. Other tests made determine worked con-

By E. P. STAHL
Garlock Packing Co., Palmyra, N. Y.

sistency, unworked consistency, water resistance, emulsibility in water, evaporation at 212 degrees F. for 150 hours, storage bleeding at room temperature, melting (dripping) point, wear in friction oxidation machine, and corrosion of a copper strip at room temperature and at 160 degrees F.

If grease is to be used as the bearing lubricant, ordinary No. 2 cup grease is suitable where low or moderate shaft speeds are encountered at a temperature range of from 15 to 150 degrees F. Higher grade greases are recommended for temperatures above 150 degrees F. but not over 200 degrees F. Grease must be practically free from acid-forming tendencies if it is to protect the highly finished surfaces of the bearings. This requires a product which is virtually neutral and which contains no fillers. It must also have qualities which resist oxidation, decomposition, separation, and the development of free acidity. Otherwise corrosion, or pitting, of the bearing surfaces may result.

Actual experience has shown that the ideal condition within a bearing housing is obtained by using a grease that will channel out after a short running period, and thus not continue to be agitated by the balls or rollers. However, the grease should be fluid enough to flow slightly so that a small amount enters the ball or roller raceways and cage and spreads over the bearing contact surfaces.

The amount of grease to use with a given bearing size and type depends upon the mechanical as well as the chemical characteristics of the grease. Some greases, particularly in the presence of condensed moisture, will aerate and increase rapidly in volume and be pumped out of the bearing housing quickly, unless efficient seals are used. Likewise, if the grease is of such consistency that it will flow readily within the bearing and bearing housing, it will be pumped out in great volume unless good seals are employed. The amount of grease needed also depends on the housing design and operating conditions. In the accompanying table are shown the approximate amounts of grease to use with the 300 series single-row ball bearings ranging in size from Nos. 304 to 312. The amount of grease in a bearing housing need not be closely controlled as is the case with oil, where a definite level must be maintained.

No ironclad rule can be followed regarding the frequency of greasing anti-friction bearings. In extremely heavy-duty service, the intervals

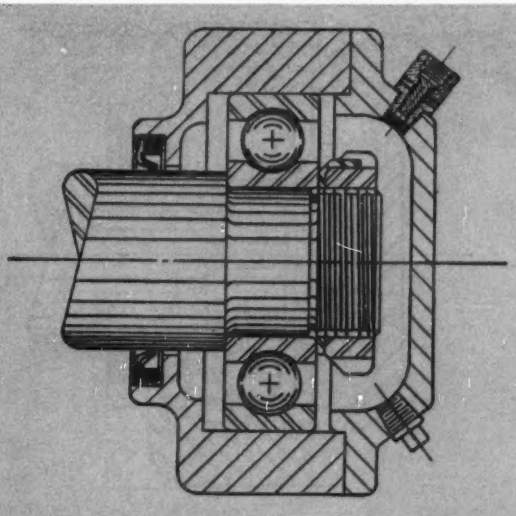


Fig. 2. By removing the drain plug from the bearing cover, contaminated grease can be readily purged.

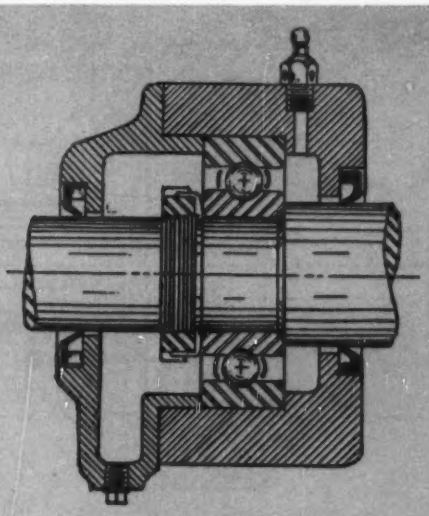


Fig. 3. In this design, the moving parts of the bearing are assured of receiving fresh grease.

Grease Requirements of the 300 Series Single-Row Ball Bearings

Bearing No.	Bearing Bore, Millimeters	Bearing Bore, Inches	Weight of Grease, Grams	Weight of Grease, Ounces
304	20	0.7870	21.0	3/4
305	25	0.9843	21.0	3/4
306	30	1.1811	21.0	3/4
307	35	1.3780	21.0	3/4
308	40	1.5748	28.3	1
309	45	1.7717	28.3	1
310	50	1.9685	28.3	1
311	55	2.1654	56.7	2
312	60	2.3622	56.7	2

can vary from six to nine months; whereas in lighter service, bearings require greasing and cleaning only annually.

Too Much Grease is as Bad as Too Little Grease

When efficient and reliable anti-friction bearing lubrication is considered, the design of the bearing housings is brought into bold focus. Although housings vary widely in construction, good design presupposes that they be made simple and compact, that satisfactory provision be made for introducing lubricant into the bearing, and that adequate space for the required amount of grease be available close to the moving surfaces. Furthermore, there must also be space for the seals which are essential to retain the grease and exclude foreign matter.

Cross-sectional views of various designs of grease-lubricated bearings are shown in Figs. 1 to 7, inclusive. The prevailing methods of pressure lubrication require that suitable fittings for the grease gun be incorporated in the bearing housing, as can be seen in Figs. 1, 2, and 3. Pressure lubrication is accepted as being efficient if proper precautions to prevent over-lubricating the bearing are observed. The grease gun must be carefully handled—otherwise too much grease can be forced into the bearing housing with the possibility of overheating the bearing.

This condition is especially apt to happen with a heavy grease because of the internal friction within the lubricant itself. At unusually elevated temperatures certain greases may experience sufficient decrease in body to cause the constituents in the lubricant to separate, with a resultant leakage and loss in lubricating value. Another real danger in over-lubricating is its likelihood of blowing the seals out of the housing.

In the bearing and seal arrangement in Fig. 1, the grease fitting provides the means not only for greasing the bearing, but also for "grease cleaning" the unit type synthetic seals, which are mounted in the housing with the sealing lips pointed outward. Seals mounted in this manner permit a small amount of grease to escape under their heels, thus functioning as pressure-relief valves. The escaping grease helps to keep the bearings and seals clean, and prevents over-lubrication.

A bearing and seal mounting at the end of a shaft (Fig. 2) has the bearing end cover tapped for a pressure-relief grease fitting and a drain

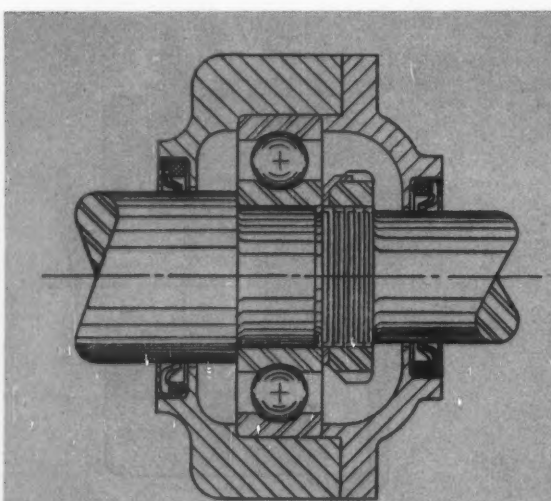


Fig. 4. No grease fitting is needed on a bearing used in light or intermittent low-speed service.

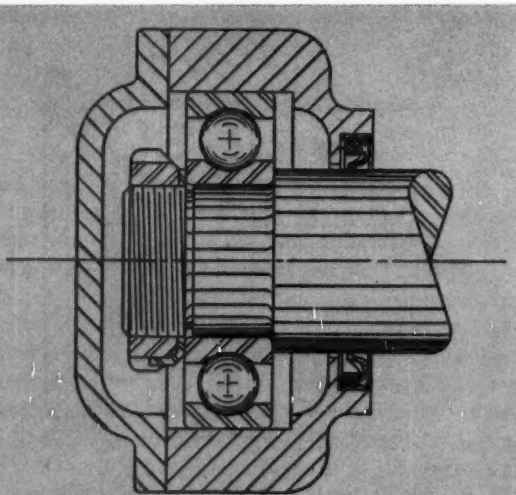


Fig. 5. An efficient seal is particularly important for a bearing which is greased only infrequently.

plug. By removing the plug it is possible to purge the bearing of contaminated grease. If, in doing this, all the grease is expelled through the escape ports of the fitting instead of through the plug hole, it is an indication that the grease has either oxidized or hardened due to heat. In this case, the cover should be removed and the housing and bearing cleaned thoroughly.

A more popular adaptation of the pressure-relief grease fitting and drain plug combination is seen in Fig. 3—a design which offers the advantage of extended intervals between greasings. The grease is supplied at a point close to one side of the cage, and works its way through the spaces between the balls of the bearing. The housing is so shaped as to direct even the smallest amount of fresh grease to areas of the bearing where it is most needed.

Ball bearings satisfactory for low-speed, light-load, and intermittent service can be seen in Figs. 4 and 5. The bearing in Fig. 4 is located against a shoulder along a shaft, and the one in Fig. 5 at the end of a shaft. These bearings require additional grease only at infrequent intervals. No fittings are provided for in the housings, and they are therefore lubricated only at periods of overhaul and inspection. Unit type seals (two in Fig. 4, one in Fig. 5) effectively retain the grease.

An installation of a shielded plate type ball-bearing housing, open at one side, is shown in Fig. 6, grease being directed from the same system which lubricates some other element of the mechanism, such as a gear-box, transmission, or right-angle drive unit. In applications of this kind, the grease must be suitable for both the element and the bearing. Also, a flinger, or baffle, is sometimes required between the bearing and the shaft shoulder to prevent any foreign matter in the grease from entering the bearing surfaces.

Fig. 7 is a drawing of a grease-lubricated ball bearing mounted on a vertical shaft on an installation where considerable foreign matter is present in the bearing area. There is a grease fitting above the bearing and a drain plug below the bearing. The plug hole should be somewhat larger than the fitting hole. The top of the housing has a unit type seal mounted in combination with a flinger which is fastened to the shaft.

Mention should be made of self-sealed ball bearings equipped with built-in seals, or inserts, made from synthetic rubber, felt, or metal. These self-sealed ball bearings are packed with a predetermined amount of high-stability ball-bearing grease at the time of manufacture. Self-sealed ball bearings have been used in inaccessible points on machines, where lubrication is apt to be neglected or overlooked. These bearings are available in standard sizes. If necessary, special sizes can also be supplied.

Oil Lubrication

Where bearings are oil-lubricated, it is essential that they not be submerged—preferably, not even partly submerged—in the oil. The danger of under-lubricating is apparent and must be guarded against, but the danger of over-lubricating is even more serious. The supply of oil to the bearing is controlled in various ways, illustrated in Figs. 8 to 12, inclusive.

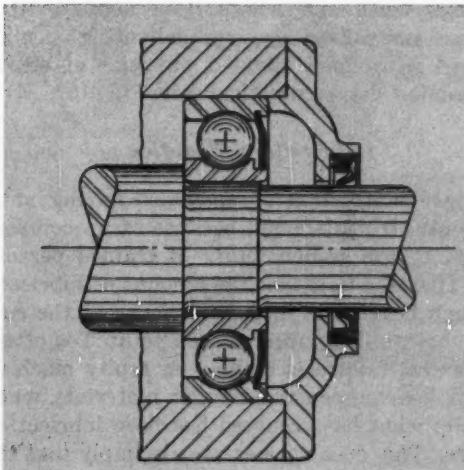


Fig. 6. The open side of this bearing receives grease from some other element of the machine.

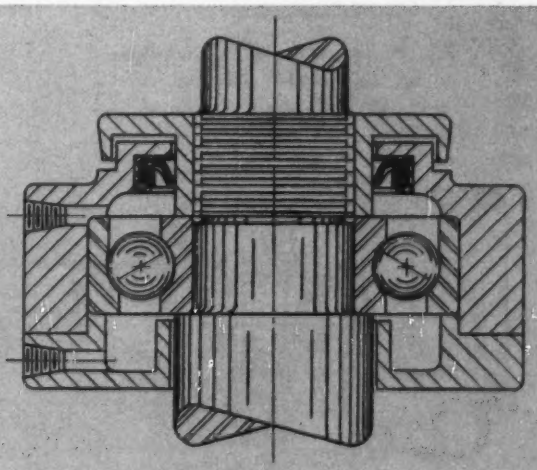


Fig. 7. A flinger above the bearing turns with the shaft in order to keep the bearing clean.

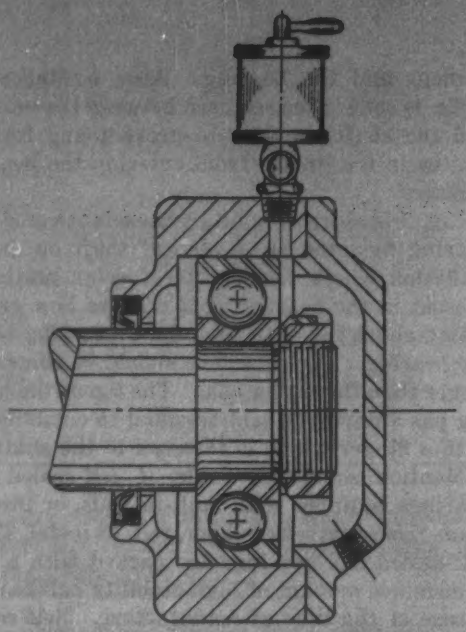


Fig. 8. The drip of the oil from the reservoir can be regulated to suit service conditions.

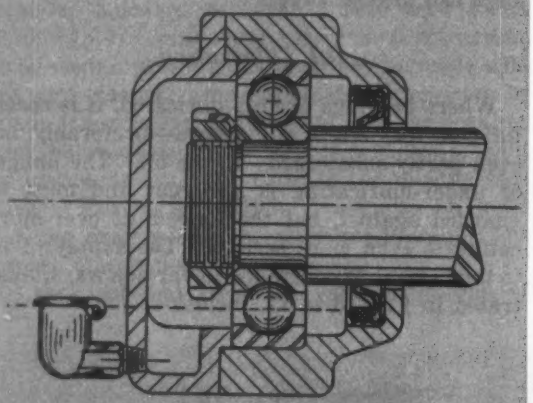


Fig. 9. The brim of the oil-cup is on the center line of the balls in their lowest position.

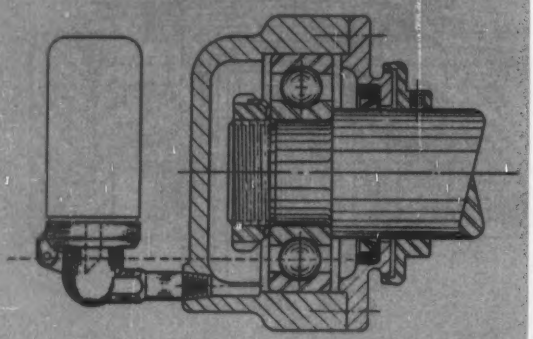


Fig. 10. The ample reservoir of this oiler lengthens the periods between refillings.

An overfeed oil-cup applied to a ball bearing on a horizontal shaft is illustrated in Fig. 8. In this application, the oil passes drop by drop through the bearing and is drained off at the opposite side. This type of cup is also used in vertical mountings.

The arrangement of a simple and well-known style of oil-cup in a bearing housing is seen in Fig. 9. The brim of the cup is in the plane of a line passing horizontally through the center of the balls when they are in lowermost position. The cup requires frequent inspection and filling to maintain the oil level. Illustrated in Fig. 10 is a ball-bearing housing having a constant-level oiler. A liberal supply of lubricant can be held in the oiler so that a controlled level of oil can be maintained in the housing for a considerable period of time.

As in the case of the grease-lubricated bearing in Fig. 6, it is also possible to lubricate a bearing with oil from the same system which lubricates some other element of a mechanism. Fig. 11 demonstrates this principle, where an oil-lubricated ball bearing is shown mounted next to a pinion. The pumping action of the teeth directs oil to the bearing.

Lubrication for a ball bearing on a vertical shaft, Fig. 12, consists of an oil-cup and an internal tapered flinger which pumps the oil upward. A small hole in the flinger prevents any capillary action and resultant siphoning of the oil from the trap at the bottom of the housing. Applications of this kind always provide close clearances between stationary and rotating members.

Centralized circulating oil systems are used advantageously in steel mills and such, and deliver a measured amount of oil to the various bearings when and where it is needed. One popular centralized system, delivering a mist charged with finely divided particles of oil, is represented diagrammatically in Fig. 13.

Lubrication Practice

Proper lubrication of machines having antifriction bearings should, because of its complex nature, be the responsibility of trained personnel. They see to it that the amount of lubricant for each bearing is just right and that the correct lubricant is applied at each point. Too often, mechanical failure is blamed on faulty machine design, bearing construction, or materials, when actually what has occurred has been lubrication failure. This does not necessarily imply that the lubricant was inferior; possibly it was either the wrong lubricant for the job or the lubrication maintenance was unsatisfactory.

Above all, the lubrication personnel must be

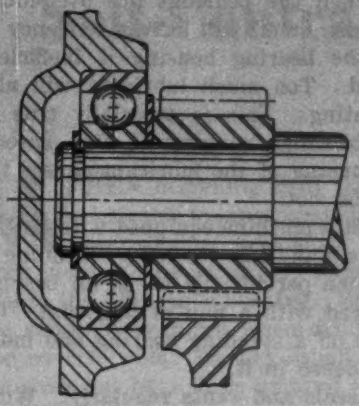


Fig. 11. The gear next to this bearing acts as an oil pump.

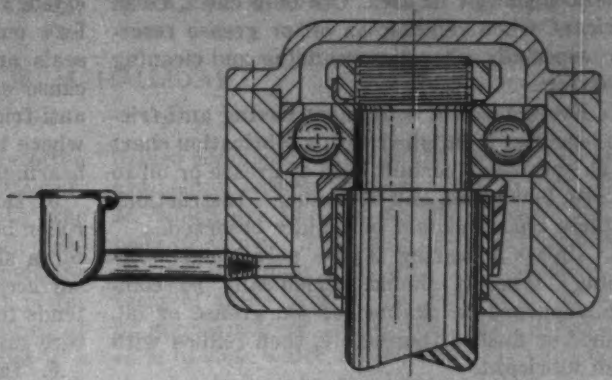


Fig. 12. An internal flinger raises the oil from the cup to the level of the balls.

familiar with the operating conditions of the particular machine. In order to lubricate a machine properly, it is advisable to ascertain what the operating conditions are—around the clock or occasional. A machine operated continuously requires different attention from the standpoint of lubrication than one operated occasionally. When establishing a lubrication schedule for a machine, it is also advisable to note whether the machine is run above, at, or below its rated capacity, and whether the bearings are subjected to unusual vibration or shock loads.

Lubrication personnel will find the following suggestions of considerable value:

1. Since dirt is Enemy No. 1 of ball and roller bearings, it is imperative that grease and oil be stored in clean containers. Handle grease with clean paddles or grease guns. Keep lubricants

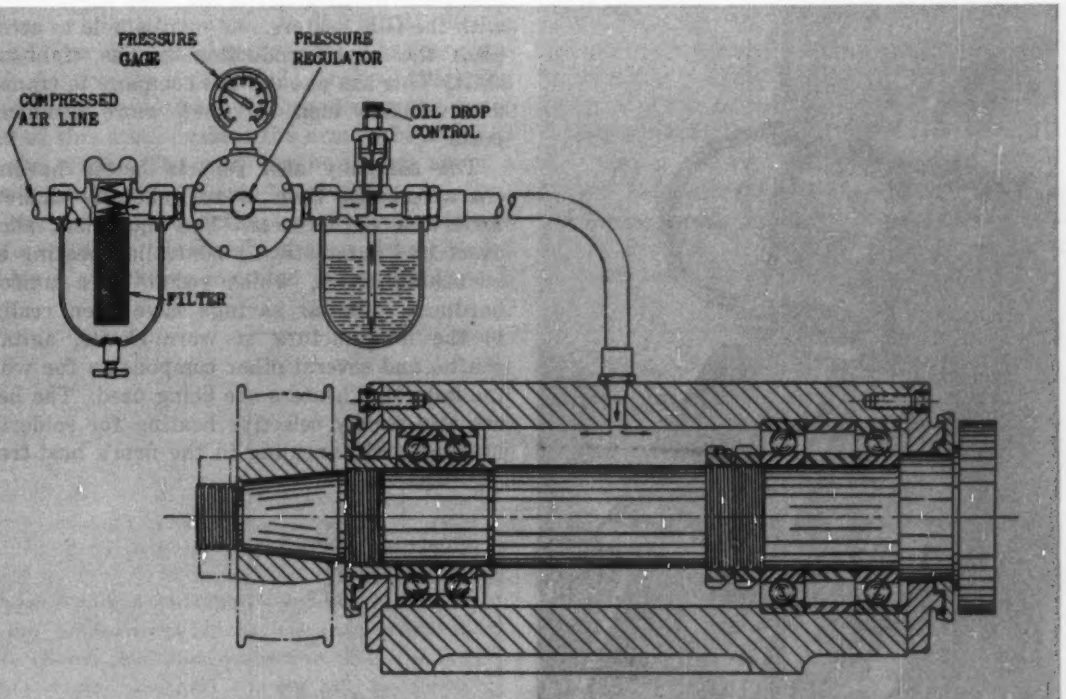


Fig. 13. Compressed air carrying oil particles does an efficient job of lubrication in this centralized system.

in waterproof and dustproof tightly covered containers when not in use. Use only clean, fresh lubricant when refilling an oil or grease reservoir, especially after disassembling and cleaning a bearing.

2. Every piece of equipment having anti-friction bearings is supplied with a lubrication chart which specifies a certain kind of grease or oil to be used, how often, and how much. Instructions on these charts should be rigidly observed.

3. Unless a bearing is of a permanent "self-sealing" type, it should periodically be completely purged or drained of old grease or oil, washed or flushed thoroughly, then refilled with fresh lubricant.

4. Do not over-lubricate. Anti-friction bearings require a surprisingly small amount of lubricant. When the bearings are over-lubricated, the grease or oil will have a tendency to leak out of the bearing housing if inefficient seals are used. Too much lubricant will also cause overheating. This is especially true of anti-friction bearings running at high speeds, where the churning of the lubricant causes the bearings to run hot.

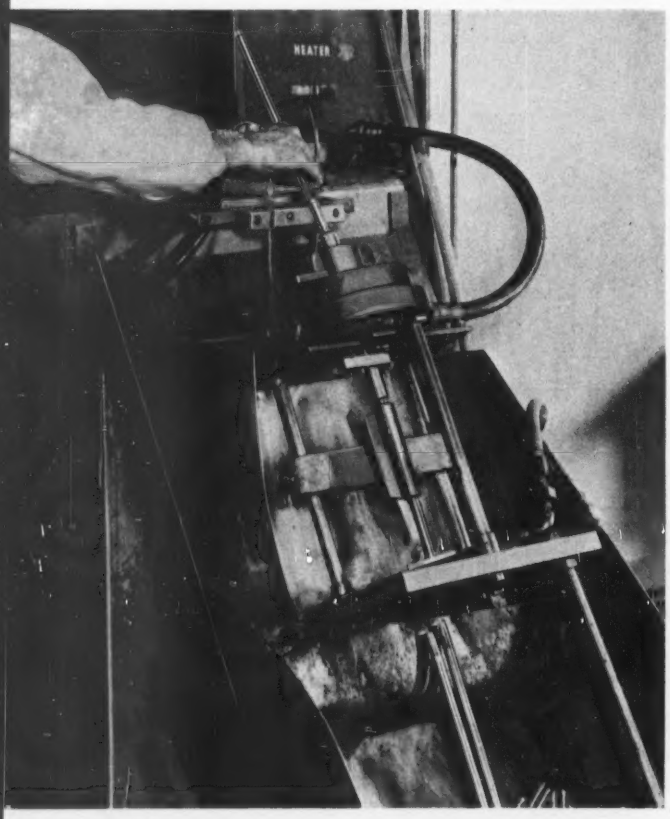
5. Do not let a machine equipped with ball or roller bearings stand idle too long. Running it for a short time periodically keeps all bearing surfaces covered with a film of lubricant. Oil tends to drain off a standing bearing and moisture may condense in it.

6. Inspect seals and vents regularly. Worn seals should be replaced with new ones. Keep vents open.

Hardening Costs Cut 48 Per Cent with Induction Heaters

A REDUCTION of 48 per cent in the cost of hardening basket shafts for use in washing machines has resulted through the use of two General Electric 15-K.W. electronic induction heaters at the Syracuse, N. Y., plant of the Easy Washing Machine Co. Before adopting the induction heater method, the firm hardened the shafts with a cyanide process. In addition to the cost of the chemicals, this process took three shifts of two men to harden 1600 shafts. Now, with the G-E heaters, one man is able to accomplish the same production in one eight-hour shift. This has allowed the company to transfer five valuable men to other, more productive posts.

The company also reports better hardness characteristics than were generally achieved under the old process. The equipment allows exact and automatically controlled heating and quenching times, which result in a uniform hardness. Similar savings have been realized in the manufacture of worm-shafts, agitator shafts, and several other components for which the induction heaters are being used. The heaters also supply selective heating for soldering, brazing, and annealing in the firm's heat-treating department.



A 15-K.W. electronic induction heater is used to harden basket shafts for washing machines. The induction coil, not visible, is inside of the quench ring into which the operator is shown inserting a shaft.

Self-Centralizing Devices for Jigs

By W. M. HALLIDAY

WHEN designing drill jigs, it is often desirable to incorporate automatic self-centralizing provisions whereby the work-piece can be accurately located with relation to the drill guide bushing. Such provisions are generally required when drilling flat plates and covers, which are not usually machined at the sides but have to be gripped or located in a jig from their rough cast edges. Similarly, such self-centralizing features will be found advantageous, time-saving, and economical in drilling parts having a similar shape, but whose over-all dimensions differ.

One of the simplest forms of self-centralizing drill jigs is shown in Fig. 1. This jig contains a rectangular cast-iron body *A*, which is flanged at the bottom for hold-down purposes. A swinging arm *B* is pivoted on a pin *C* that is pressed into both side walls of a slotted boss on top of the body. Arm *B* carries the drill bushing *D*.

Pressed into the under side of the arm, each side of the bushing, are two bearing pads *E*. When the arm is in the horizontal position, as shown, these pads will press equally on the work-piece *X*, holding it firmly to the top of the jig body. The right-hand end of arm *B* has an open-end slot for the cylindrical shank of clamping stud *F*. A knurled nut *G*, threaded on the upper end of this stud, enables the arm to be clamped to the work. The stud can be swung about a pivot pin *H* pressed into the body.

The centralizing action on the work-piece is obtained from identically shaped spring-loaded slides *J*, which are mounted in a guide hole *K* drilled completely through the body. Springs *L* are held in pockets in these slides by stop-plates *M*, which are fastened to the sides of the jig body by screws. Each slide has a vertical projection at the inner end, with the hardened end faces of these projections inclined at an angle of approximately 10 degrees. The projections slide in slots which extend from the top edge of the jig body into the bearing holes *K*. The springs force the slides inward, toward each other, and the extent of this movement is limited by either the end faces of the slots or the work-piece, as shown.

A large-diameter vertical hole extends down through the body, directly below the hole to be drilled in the work-piece, for chips to fall out of the jig. A short cylindrical plug, cross-drilled as shown, is tightly pressed into hole *K* to lie midway between slides *J*. This plug prevents chips from entering the hole *K*.

To mount a work-piece in the jig, arm *B* is swung upward. The two opposed slides *J* will be in their innermost positions, in contact with the end faces of the slots, and the work-piece is placed between the inclined faces of the slides. Transverse location of the work-piece is obtained by abutting it against a plate *O* fastened to the top face of the jig body. Arm *B* is then lowered into the horizontal position, and clamping stud *F* is swung into its vertical position, as shown. As nut *G* is tightened, pads *E* bear down on the work-piece and press it into contact with the top of the jig body. This action will cause the slides to move apart an equal amount, and the work-

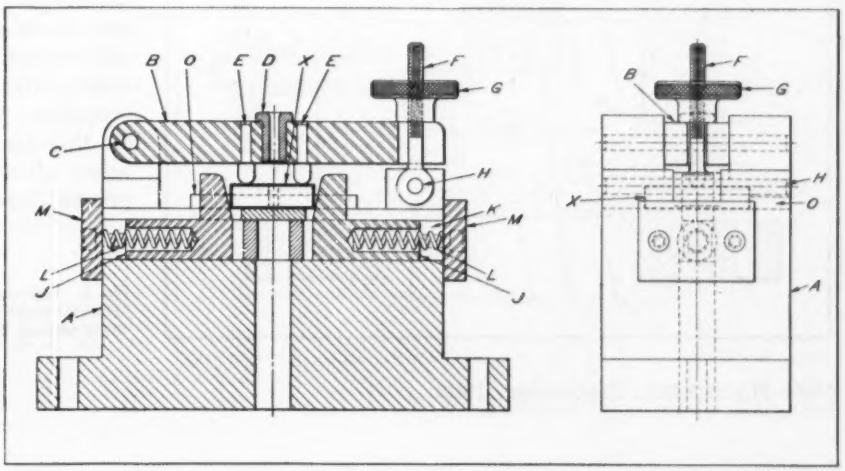


Fig. 1. Centralization of the work-piece in this drill jig is obtained from spring-loaded slides (J) mounted in guide hole (K).

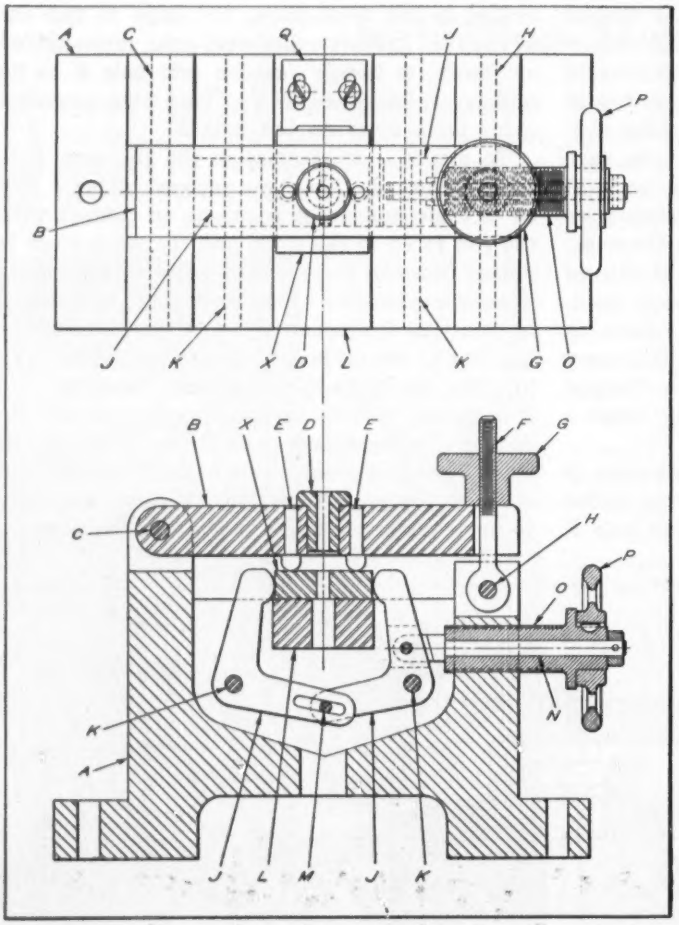
tion to bushing *D*. Parts differing considerably in width can be accommodated without difficulty in such a jig, because the slides can be arranged with an appreciable amount of opening and closing. Also, the jig may easily be adapted to increase these facilities merely by altering the angle of taper on the slides.

A rather unusual yet simple self-centralizing jig, which may be successfully employed in drilling parts having considerable variation in width or length, is seen in Fig. 2. The construction of this jig permits a more accurate location of the work-piece than is possible with the design illustrated in Fig. 1. As with the jig previously described, a swinging arm *B* is pivoted on a pin *C* which is pressed into jig body *A*. A drill bushing *D* is carried in the arm, and located on each side of this bushing are the identical bearing pads *E*. The right-hand end of arm *B* is slotted to admit clamping stud *F*, which is fitted with a knurled nut *G* and pivoted on pin *H*.

The bellcrank locating and clamping levers *J* are a sliding fit within a narrow slot in the jig body, and pivoted on pins *K* pressed into the in the body is a platform *L* for supporting the work-piece *X*. Vertical clearance holes are provided in this platform and in the jig body for the chips to fall through.

The upper inner edges of levers *J*, which contact the sides of the work-piece, are rounded and hardened, and can be serrated to provide a better grip. The lower ends of the levers are reduced to half their total thickness so that they overlap, and the left-hand lever is slotted to fit over a pin *M* pressed into the tail of the right-hand lever. When the lower halves of the levers are in a horizontal position, the center of pin *M* is aligned with the vertical center lines of the jig body and drill bushing. This arrangement insures that the levers will be swiveled equally.

Actuation of the levers is obtained by means of rod *N*, the slotted shackle end of which is pinned to the right-hand lever. The cylindrical shank of rod *N* is a running fit within an externally threaded sleeve *O* which is screwed into the right-hand wall of body *A*. When handwheel *P* is rotated, levers *J* will be swiveled, due to the force of sleeve *O*, against the shoulder on rod *N* or the collar pinned to the rod.



The manner of loading and using this jig is similar to the one previously described. With arm *B* raised, work-piece *X* is placed on platform *L*. The contact surfaces of levers *J* will have been moved apart by rotating handwheel *P*. Transverse location of the work-piece is obtained by abutting it against an adjustably mounted stop-plate *Q*. The handwheel is then rotated in the opposite direction until the work is firmly gripped and centralized by the contact surfaces of the levers. Arm *B* is then returned to the horizontal position shown, and clamped by tightening nut *G*. Additional clamping pressure is thus exerted on the work by pads *E*.

Another type of self-centralizing jig that has been proved economical and accurate in drilling uniformly central holes through thin cover plates and similar parts having variations in width is seen in Fig. 3. In this jig, a swinging arm *B* is again pivoted on a pin *C* which is pressed into the jig body *A*. The

Fig. 2. Bellcrank locating and clamping levers (J) are actuated by rod (N) when handwheel (P) is rotated, thus centralizing work-piece (X).

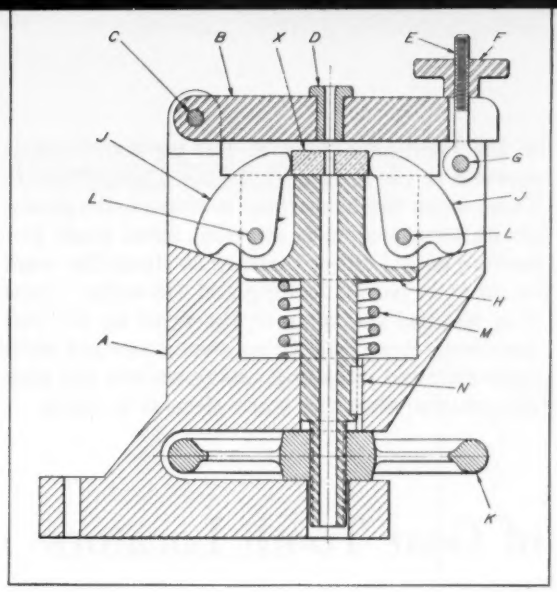


Fig. 3. In this drill jig, work-piece (X) is centralized by locator pads (J), which are pivoted about pins (L) when handwheel (K) is turned.

arm carries a drill bushing *D*, and its right-hand end is slotted for a ring-head clamping bolt *E* that carries nut *F* and is pivoted on pin *G*.

A spring-loaded cylindrical plug *H* is a sliding fit in the vertical bore of the jig body. Rotation of the plug is prevented by a key *N*. The lower threaded end of the plug is screwed through a handwheel *K* which is carried in a horizontal slot in the jig body. The upper head of the plug, on which the work-piece *X* rests, has two diametrically opposite slots into which are fitted the triangular-shaped locator pads *J*. These pads pivot on pins *L* pressed into the side walls of the slots. The lower, outer corner of each locator pad rests on the tapered bottom surfaces of slots cut in the side walls of the jig body.

In operation, arm *B* is raised, and a work-piece is placed on top of plug *H*, being located against a fixed pin or plate, not shown. Then, by turning handwheel *K*, plug *H* is drawn downward—against the action of spring *M*—and pads *J* are pivoted toward each other, thus centralizing and gripping the work-piece. Arm *B* is then lowered into the horizontal position shown and clamped by tightening nut *F*.

Wear can be minimized in this jig by screwing a hardened head set-screw into the tapered bottom surfaces of the slots cut in the side walls of the jig body. The rounded contact points of pads *J* would then bear on the hardened heads, and slight adjustments could be made by tightening or loosening the set-screws.

Another effective method of obtaining centralization of the work is illustrated in the drill jig seen in Fig. 4. Secured to the top, near the rear edge of jig body *A*, is a slotted bracket *B*. A swinging arm *C*, pivoted about a pin pressed into the uprights of bracket *B*, carries drill bushing *D*. The forward end of this arm is slotted to admit the shank of a ring-head clamping bolt *E* that carries a knurled clamping nut *F*. The ring head of the clamping bolt is a close fit in a slot on a bracket *G* secured to the front of the body, and pivots about a pin pressed into the uprights of this bracket.

Work-piece *X* is placed on the top surface of jig body *A*, bearing against a stop-plate *H* secured to the body for lengthwise location. The part is centralized transversely and gripped by means of two bars *J* which rest on the smooth top surface of the jig body. The inner contacting surfaces of these bars are relieved slightly to reduce the frictional pressure on the work-piece.

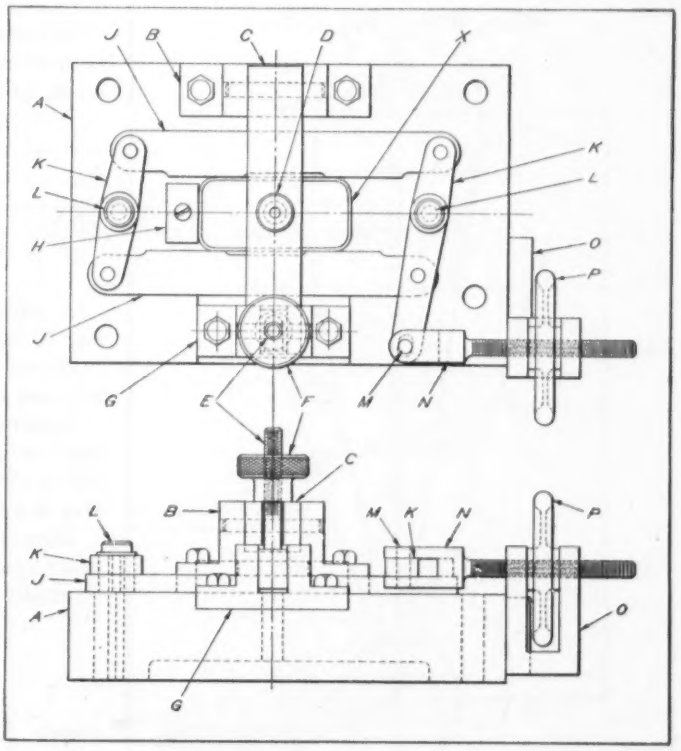


Fig. 4. Another effective method of centralizing a work-piece makes use of a pantograph mechanism—bars (J) and levers (K).

The ends of both bars are pinned to levers *K*, thus forming a pantograph mechanism. Levers *K* can be pivoted about the two headed studs *L* which are screwed into the top flat surface of the jig body.

The front end of the extended right-hand lever *K* has an elongated slot to fit around a pin *M* pressed into the slotted end of rod *N*. The threaded shank of rod *N* passes through plain holes in both walls of a slotted bracket *O* secured to the right-hand edge of the jig body, and is screwed in the internally threaded handwheel *P*. Thus, when the handwheel is rotated, the pantograph lever system is swiveled about studs *L*—moving bars *J* either together to clamp the work or apart to permit loading and unloading. Arm *C* is handled the same as the arms on the jigs previously described, being swung upward while unloading and reloading, and down into the position shown when the work-piece is in place.

Calculating Dimensions of Gear Tooth Locators

By CARL A. JOHNSON

FORMULAS for calculating the dimensions of gear tooth locators were given in January, 1952, MACHINERY, page 196. Some of these formulas are, however, limited to locators for gears of standard proportions. The material here presented extends their application to cover gears of any proportions.

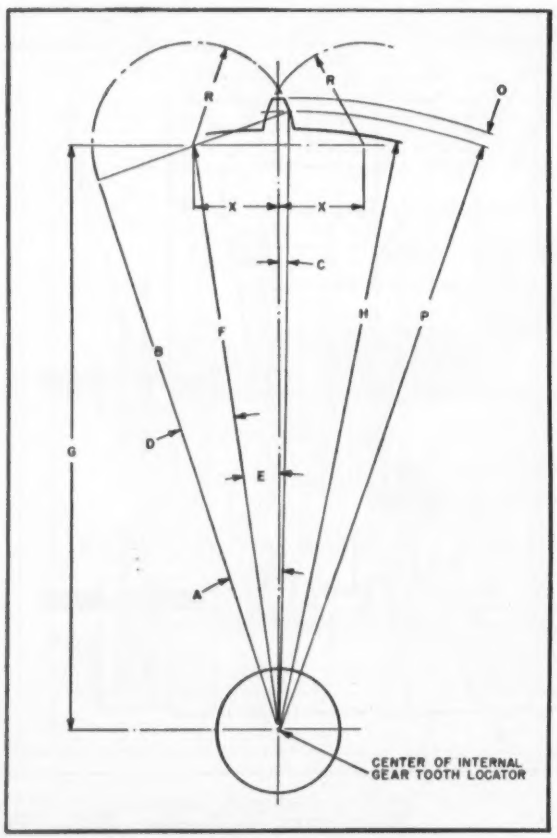


Fig. 1. An enlarged view of the locating tooth employed on an internal gear tooth locator

An enlarged view of the locating tooth of a typical internal gear tooth locator is shown in Fig. 1. The angle *C* was given in the January number as

$$C = \frac{90}{N}$$

where

N = number of teeth in the internal gear.

This formula is applicable to teeth of standard proportions, but a more general formula would be as follows:

$$C = \frac{S}{2P} \times 57.296$$

where

S = circular width of tooth space on pitch circle of internal gear.

A pawl type locator for external gears, similar to the one described in the previous article, is shown in Fig. 2. It is applicable to both standard and non-standard tooth proportions.

Dimension *G* will vary with the sizes of the part or assembly to be inspected or machined, and is obtained by referring to the tool construction drawing.

Dimension *S* equals the circular width of the tooth space on the pitch circle of the gear.

Angle *A* equals pressure angle; and

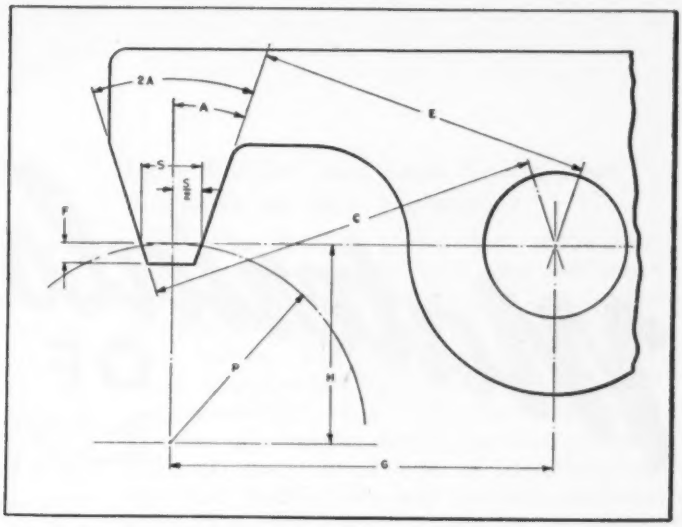
$$F = \frac{O}{2}$$

where

O = dedendum of teeth in gear.

$$C = \left(G + \frac{S}{2} \right) \cos A$$

Fig. 2. Pawl locator of the type employed to position a part or assembly with relation to a tooth space in an external gear



$$E = \left(G - \frac{S}{2} \right) \cos A$$

and

$$H = P$$

where

P = pitch radius of the external gear.

Similarly, the pawl type locator employed for gaging purposes, Fig. 3, is a slight modification of one previously mentioned. This is a flush-pin type inspection device, and the opposite end of the pawl must lie within a 0.006-inch step if the external gear being inspected is acceptable.

Dimensions C and E will vary with the size of the gear, and can be obtained from the gage lay-out or construction drawing. Dimension S equals the circular width of the tooth space on the pitch circle of the gear, and P is equal to the pitch radius.

The following formulas are used to obtain the other dimensions:

$$F = C + O$$

where

O = dedendum of teeth in gear.

$$G = \left(E + \frac{S}{2} \right) \cos A$$

$$H = C \times \sin A$$

$$B = S \times \cos A$$

$$J = G - (H + B)$$

$$K = P$$

where

A = pressure angle of gear.

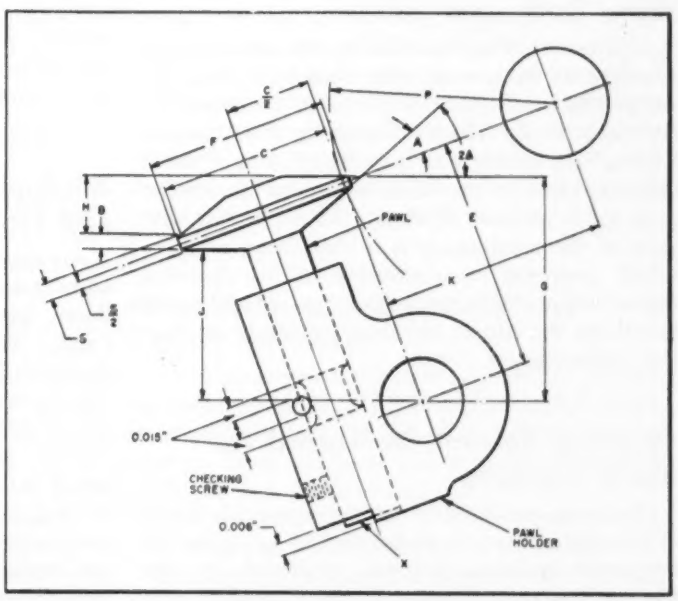


Fig. 3. Flush-pin type of pawl locator. With the gear located radially and the pawl inserted in a tooth space, surface (X) on the pawl must lie within the step on the pawl holder.

Materials OF INDUSTRY

The Properties and New Applications of Materials Used in the Mechanical Industries

Graphitic Tool Steel Available in Hollow Bar Form

A graphitic steel product which may be used in manufacturing ring gages, dies, and other annular tool steel parts has been announced by the Steel and Tube Division of the Timken Roller Bearing Co., Canton 6, Ohio. "Graph-Mo Hollow-Bar," as this new product is called, is a turned and bored bar section using Graph-Mo tool steel for the basic material. It will have all of the advantages of graphitic type tool steel, such as machinability comparable to that of gray cast iron, and good wear resistance. Stock sizes will range from about 3 to 16 inches outside diameter, with a variety of wall thicknesses.

Drawing Compounds for Non-Ferrous Wire, Rods, and Tubes

Alkaline drawing compounds for wet-drawing non-ferrous wire, rods, and tubes have been developed by the Nopco Chemical Co., 15 Essex St., Harrison, N. J. These compounds, the "Durpon Series," are said to lengthen die life and to lower drawing costs by providing optimum lubrication over long periods of time. Incorporated into each of the compounds is a stabilizing additive which prevents contamination of the drawing ingredients. This preserves the stability and lengthens the life of the drawing emulsion during recirculation.

Chemical Solvent Developed for Metal Cleaning

Cleaning metal parts by removing all traces of oil and grease is accomplished by using an improved chemical solvent marketed by the Wayne Chemical Products Co., Copeland and MCRR, Detroit 17, Mich. "Kemisol A," as it is called, when mixed in a solution of from 1/2 of 1 per cent to 1 per cent with water at approximately 180 degrees F. offers a thin, inexpensive solution which can be used in almost all methods utilized for cleaning metal parts. It is odorless, non-corrosive, non-toxic, non-inflammable, and harmless to the skin.

The solvent is used in the manufacture of ball and roller bearings and other parts prior to heat-treatment, for cleaning parts before chromium-plating or lacquering, for cleaning machined aluminum aircrafts parts, and for many other applications.

Lubricant Developed for Pneumatic Die Cushions

Dayton Rogers Mfg. Co., 2829 13th Ave. S., Minneapolis 7, Minn., has recently marketed a specially compounded lubricant for pneumatic die cushions. This lubricant provides proper lubrication for the cylinder and piston and other working parts, and prolongs the life of cup packings on the die cushion cylinders. It is available in 10- and 35-pound pails.

Alkaline Stripper Removes Tin, Lead, and Tin-Lead Alloys

An alkaline chemical for dissolving tin, lead, and tin-lead alloys has been announced by Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn. This material, called Enthone Solder Stripper, is used in water concentrations of from 1 to 3 pounds per gallon at temperatures of from 160 to 180 degrees F. The stripper is said to remove tin, lead, and tin-lead electrodeposits, heavy solder, and hot-dipped coatings. Since it is alkaline in nature, there is no attack upon the base metals such as copper, brass, bronze, steel, and stainless steels, thereby causing no dimensional change in these base metals.

The stripping action on both tin and lead is at a rate of 0.005 to 0.010 inch per hour. The material is kept in steel or stainless-steel containers and does not deteriorate with

Tellurium Copper Alloy Exhibits Free Machinability

The Chase Brass & Copper Co., Waterbury 20, Conn., has announced the availability of a tellurium copper alloy with a machinability approaching that of free-cutting brass and an electrical conductivity 90 per cent of that of pure copper. This alloy, called Chase Tellurium Copper, may be hot-worked and also severely cold-worked, although it is somewhat less ductile at room temperatures than pure copper. It is well adapted for use in welding and cutting tip products because of its machinability and its high thermal conductivity. The alloy is supplied in a hard or half-hard temper in the form of rod and bar.

Corrosion- and Heat-Resistant Coating for Sheet Steel

A coating, known as "Leafcote," for protecting sheet steel against corrosion and excessive heat has been developed by the Mid-America Steel Warehouse, 1000 W. 50th St., Chicago, Ill. This coating, which is tough and adhesive, is applied to both sides of cold- or hot-rolled sheet steel that has been degreased, pickled, and phosphatized. After the steel sheet has been heated, the coating is applied and then baked. It is said that the coating will not peel or crack in subsequent drawing or forming operations. It may be used as a prime coating and finished in any desired color.

Transparent Cutting Agent for All Metal-Cutting Operations

A sulphur-free metal-cutting agent for use with all types of metal-cutting operations, has been brought out by the Metalloid Corporation, Huntington, Ind. This agent employs as a catalyst an organic compound which is said to be non-staining and transparent. The cutting agent is odorless and non-toxic. It employs any regular paraffin or naphthenic cutting oil as its vehicle and may be used in ratios as high as 4 to 1, thereby making it economical to use.

This agent, designated Metalloid X-30, is said to prolong tool life and aid in giving a good surface finish. Applications include the manufacture of silver bearings and other alloys where processed cutting agents have not been previously permissible because of staining characteristics. It is suited for grinding operations, as it is completely transparent and permits the grind-

New Bonder and Leak Sealer that Adheres to Any Material

The Allen Products Corporation, 20450 Sherwood Ave., Detroit 34, Mich., has introduced "Seal-All," a compound that is said to adhere to any material, toughen with age, and never become brittle. The new product bonds wood, metal, glass, rubber, fabric, and plastic quickly and permanently. It is said to be unaffected by gasoline, oil, naphtha, alcohol, or water. It seals leaks effectively in all types of containers and rigid and flexible lines, and has been used successfully to impregnate castings for the prevention of leaks.

Heat-Resistant Aluminum Paint for Metal Surfaces

The application of a new ready mixed aluminum paint to practically any metal surface permanently bonds the paint to the surface upon subjecting the painted metal to a heat of from 500 to 1600 degrees F. Announced by the Sheffield Bronze Paint Corporation, 17814 Waterloo Road, Cleveland 19, Ohio, this product is known as Sheffield "Super-Hot." It will add a protective and decorative finish to metal surfaces withstanding temperatures of 1600 degrees F. The greater the heat, the more permanent the bond because it alloys itself to the metal surface with the application of heat. It maintains its brilliance, will not crack, chip, or peel, and is impervious to most ordinary solvents.

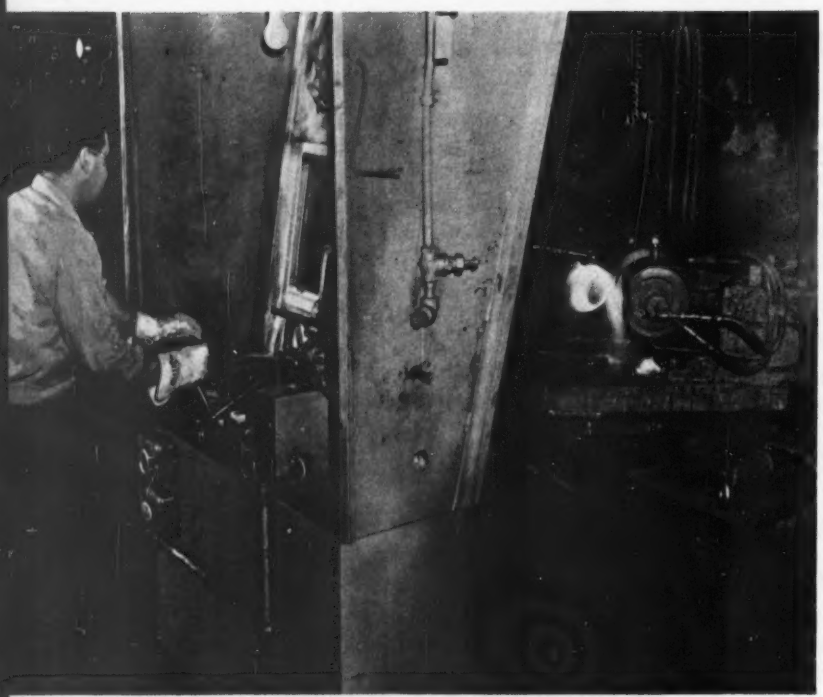
It may be brushed, sprayed, or dipped, and air dries within thirty minutes, after which time heat can be applied. Although best results are obtained when application is made on clean, dry surfaces, it may be applied to surfaces which are rusty, moderately greasy, or oily.

Phosphoric Acid Organic Primer Resists Corrosion

An organic coating, called "Lankote PR-1," has been developed by J. Landau Co., 221 Wooster St., New York 12, N. Y. The coating may be used on those surfaces which normally require phosphatizing, Parkerizing, or Bonderizing. It may be sprayed, brushed, or roller-coated onto a surface and air-dried or baked in a few minutes.

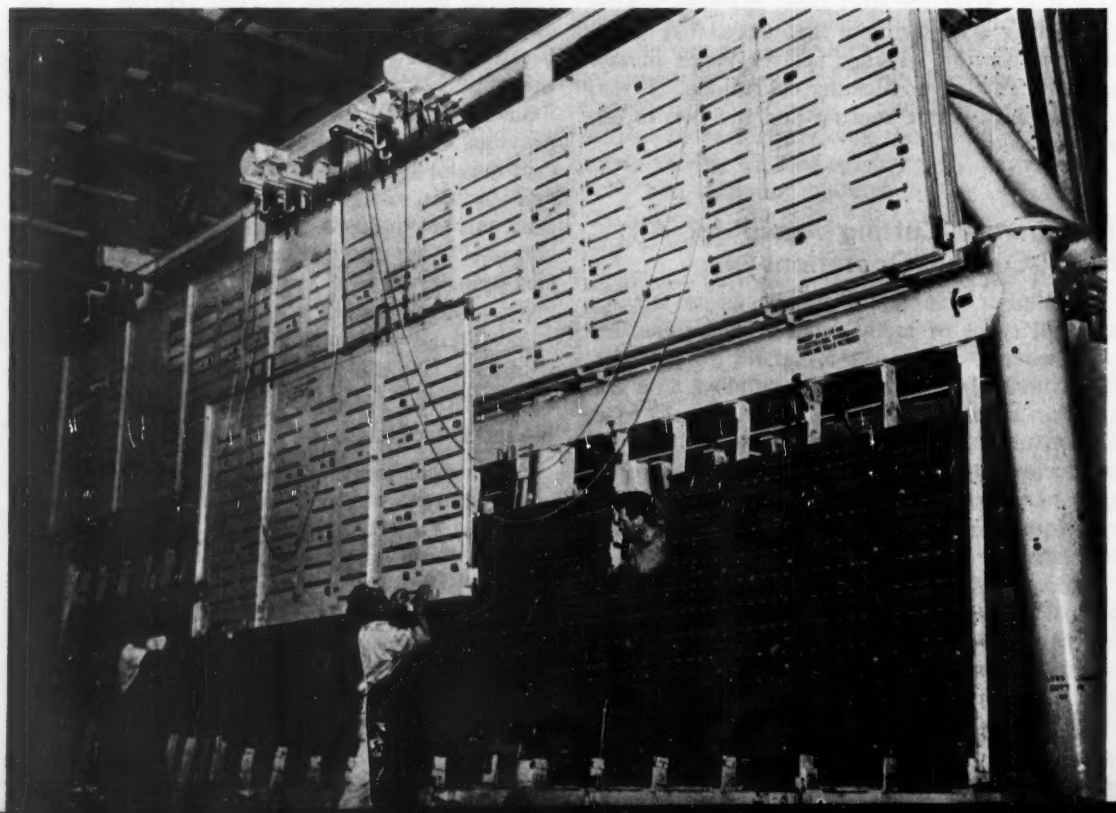
This coating adheres to metals with a bond that is half mechanical and half chemical due to the etching action of the acid diluting agent. It is supplied as two components which are mixed prior to use. Once mixed, the primer must be

In Shops Around the



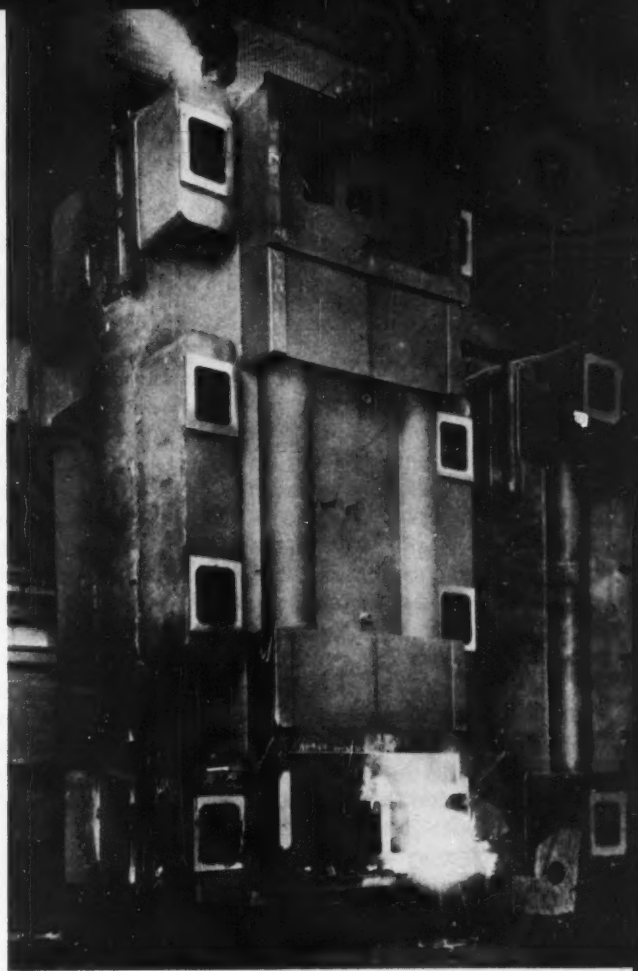
Ends of fire extinguisher cylinders are hot-formed and closed on this semi-automatic machine at the Belleville, N. J., plant of Walter Kidde & Co., Inc. The cylinder ends are preheated in induction coils to a temperature of 2000 degrees F., and kept hot during forming by a heating head utilizing a fuel gas burned with oxygen. By substituting oxy-propane for oxy-acetylene in the gas heating head, a 30 per cent saving was obtained.

Magnesium floor panels for a new cargo model of the Lockheed Super Constellation are being drilled in record time, with a saving of thousands of man-hours, by means of this two-story high, double-sided drill jig that weighs 30,000 pounds. Movable drill plates are lowered into position by overhead hoists.



Country

Camera Highlights of Some Interesting Operations Performed in Various Metal-Working Plants throughout the Nation



Giant generator stator, requiring more than 3000 feet of welds, is shown being chipped and finish-welded at the General Electric Co.'s, Schenectady, N. Y., Works. G-E 500-ampere, alternating-current arc welders, and 300-ampere, direct-current arc welders were used for welding the huge frame in three positions.

A steady flow of brass and copper sheet is maintained between rolling, annealing, pickling, and storage areas by means of a continuous conveyor system in the plant of the Chase Brass & Copper Co., Waterbury, Conn. Overhead cranes, roller conveyors, and industrial trucks also help to completely eliminate manual handling of sheet.



Various Gages for Inspecting Diameter of Under-Cut Bores

By ROBERT MERY
Liberty Products Corporation
Farmingdale, L. I., N. Y.

MANY variations are required in the gages used to inspect the diameter of under-cuts. This is necessary because of different bore and under-cut sizes, the allowable tolerances, variations in the distance of the recess from the end of the work-piece, blind holes, etc. Some of the gages designed by the author to suit such conditions are here described.

The inexpensive gage shown in Fig. 1 is suitable for inspecting the diameter of under-cuts where the bore is small and has a close tolerance (not more than ± 0.001 inch), and the tolerance on the diameter of the under-cut is relatively large (± 0.010 inch or more). In such cases, the small bore tolerance can be ignored, and the dimension from the bore to a point on the under-cut surface can be inspected. The top surface of plug *A* is rounded to form a radius slightly smaller than that of the under-cut, and its sides are flattened to facilitate entry in the bore. A bent pin *B* is secured to the plug and serves as a handle for inserting and removing the plug. A two-diameter pin *C* is inserted in the bore, lifting plug *A* into the under-cut, and serves as a "Go" and "No Go" gage.

Flush-pin type gages, such as the one seen in Fig. 2, can be used to inspect the diameter of relatively wide or concave recesses. On this gage, diameter *A* is made a fairly close fit in the bore, and shoulder *B* acts as a stop against the end surface of the work-piece when the gage is placed into position. Balls *C* are forced into con-

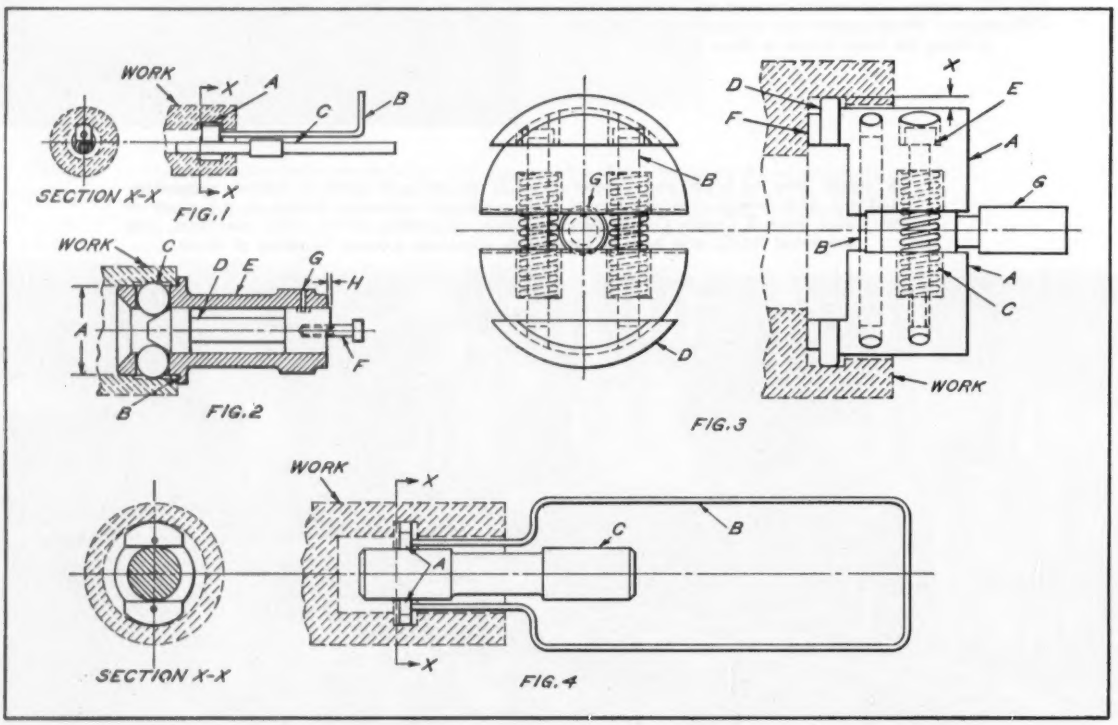


Fig. 1. Simple gage suitable for inspecting diameter of under-cut in close tolerance bore. Fig. 2. Flush-pin type gage for inspecting wide or concave recesses. Fig. 3. Spring-loaded blocks (A) and a "Go" and "No Go" plug (G) are used in this under-cut gage. Fig. 4. Gage suitable for inspecting the diameter of recesses in bores having a relatively large tolerance

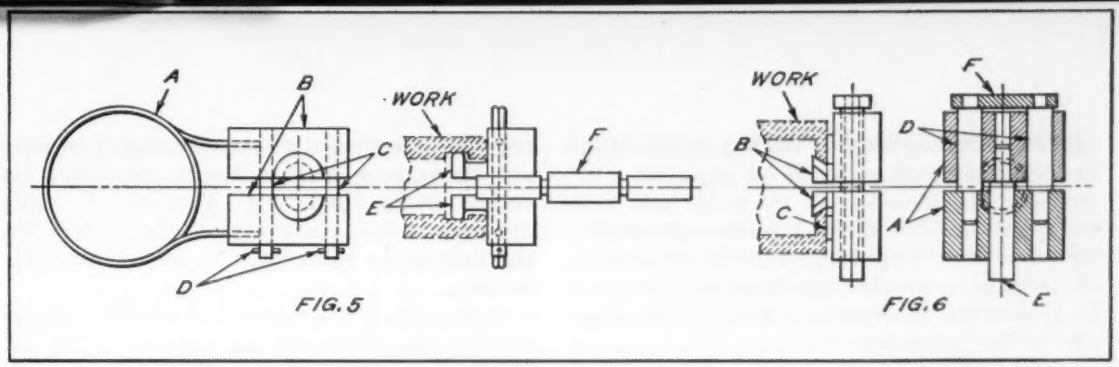


Fig. 5. A double-coil spring (A) is used to bring blocks (B) together while inserting the gage in the bore, and forcing the blocks apart to bring lips (E) into contact with the under-cut. Fig. 6. Specially designed gage for measuring the diameter of a tapered under-cut in the face of a work-piece

tact with the recess to be measured by pressing the tapered end sliding plug *D* inward. This is accomplished by gripping the knurled right-hand end of gage body *E* and pressing on the end of cap-head screw *F*. A pin *G*, pressed into body *E* and projecting into a slot in plug *D*, limits the longitudinal movement of the plug. The right-hand end of sliding plug *D* is ground with a step corresponding to the tolerance on the recess diameter. Dimension *H* is proportionately larger than the tolerance to compensate for the steep angle on the tapered end of the plug.

Relatively large diameter under-cuts can be inspected by means of the gage seen in Fig. 3. The gage is made up of two semi-cylindrical blocks *A*, with two dowels *B* a press fit in the upper block and a sliding fit in the lower block. Seated in pockets in the blocks are two springs *C* which force lips *D* on the blocks into contact with the under-cut. Socket-head cap-screws *E*, which pass through the center of the springs and are screwed into the lower block, limit the distance that the blocks can be forced apart. The radius of lips *D* is slightly smaller than that of the bore to facilitate entry of the gage in the work-piece when the blocks are squeezed together against the action of the springs. Dimension *X* must be larger than the depth of the under-cut to allow sufficient movement. The front faces *F* on the blocks serve as locating stops, contacting a shoulder in the bore of the work-piece when the gage has been brought into proper position. "Go" and "No Go" plug *G* is inserted between the blocks, as shown, to inspect the diameter of the under-cut.

In cases where the bore has a relatively large tolerance that cannot be ignored and when the tolerance on the recess diameter is small (about $\pm$ 0.001 inch), it becomes necessary to measure directly between diametrically opposite points in the recess. This can be accomplished with an inexpensive gage such as the one seen in Fig. 4. Plugs *A* are similar to one employed on the gage seen in Fig. 1, with their sides flattened and their radii slightly smaller than that of the recess. In this gage, however, the two plugs are connected by a spring wire *B* which serves as a handle. The plugs are brought together by squeezing the handle, and they can then be inserted in the bore. When the handle is released, the action of the spring forces the plugs into contact with the recess. A "Go" and "No Go" plug *C* is then placed in the bore, between the plugs, to gage the diameter of the recess.

The gage shown in Fig. 5 is similar to the one seen in Fig. 3, with the exception that only one actuating spring is employed and this is mounted on the outside of the gage. The ends of the double-coil spring *A* are pressed into holes in the sides of blocks *B*. Dowels *C* are a press fit in the upper block and a sliding fit in the lower block. Cross-pins *D* keep the lower block from sliding off the dowels. To insert the gage, the blocks are squeezed together by compressing the spring. When the spring is released, lips *E* are forced into contact with the under-cut. As in previous gages, a "Go" and "No Go" plug *F* is placed between blocks *B* to gage the under-cut.

While the gage seen in Fig. 6 is specifically designed to measure the diameter of a tapered under-cut in the face of a work-piece, it can easily be adapted to recesses of other forms. Both upper and lower blocks *A* have conical lips *B* which contact the tapered under-cut, and blocks *C* which locate the gage against the face of the work-piece. The sides of lips *B* are flattened so that the lips can be inserted in the small hole of the part. Guide pins *D* are pressed into the lower block and slidably mounted in the upper block, while guide pin *E* is a press fit in the upper block and slides in the lower block. Pins *D* are connected by bridge *F*. When pressure is

applied simultaneously to the top of the bridge and the lower end of pin *E* by means of a micrometer, the shoulders on the guide pins force the blocks apart and the lips into contact with the under-cut. Depending upon the dimensions of the gage, a simple formula can be developed to convert the micrometer reading to the diameter of the under-cut.

Another flush-pin type gage is shown in Fig. 7. In this case, the work-piece *A* has a narrow, comparatively deep recess at the bottom of a fairly large, blind bore. Gage body *B* has two large-diameter bearing surfaces which slide in the bore of the work-piece, and is centrally bored to hold the sliding pin *C*. The left-hand face of body *B* is slotted to guide the two sliding gage fingers *D*. A plate *E*, secured to this face of the body by four screws, retains the fingers in place and serves as a locating stop by contacting the bottom of the blind bore. Two pins *F*, which are pressed into the fingers *D* and project into the slots in the body, limit the movement of the fingers.

Sliding pin *C* is actuated by a handle *G* pressed into the pin. When the pin is moved to the left, its tapered end lifts fingers *D* into contact with the recess in the work-piece. A step ground in the right-hand face of pin *C* indicates whether the diameter of the recess is within the required tolerance. When the gage is removed from the bore by pulling on handle *H*, the tapered back-faces of fingers *D* strike the recess corner, forcing the fingers toward the center and permitting withdrawal.

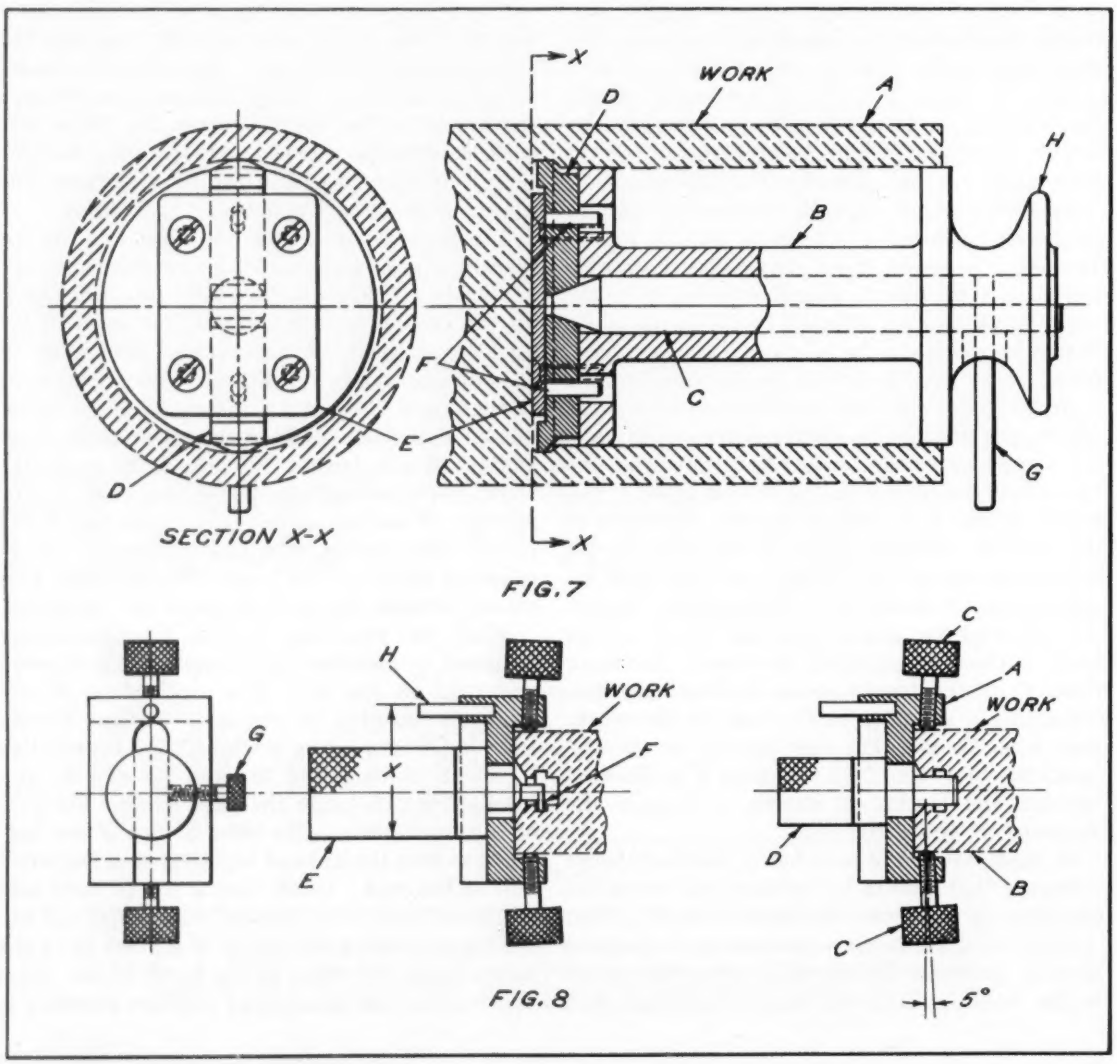


Fig. 7. Flush-pin type gage for inspecting the diameter of a narrow, comparatively deep recess at the bottom of a fairly large, blind hole. Fig. 8. Diameter of a close tolerance under-cut in a bore only 1/4-inch in diameter is determined by means of this gage.

The gage seen in Fig. 8 was designed to determine the diameter of a close tolerance under-cut in a bore having a diameter of only 1/4 inch. In using the gage, the first step is to fasten gage body *A* to the work-piece *B* with screws *C*, using a temporary plug *D* to centralize the work, as shown at the right. Screws *C* are mounted at an angle of 5 degrees to pull the gage body toward the work.

When the body has been secured to the work, centralizing plug *D* is withdrawn and gaging plug *E* substituted, as seen in the center of Fig. 8. Both plugs are provided with flats to fit the slot in the left-hand face of the body and permit only radial movement of the plugs. In introducing plug *E*, it must be held off center so that lip *F* will clear the bore. Then, the gaging plug can be slid downward to bring the lip in contact with the under-cut. Plug *E* is held in this position by tightening screw *G*, and a micrometer is used to measure dimension *X* over pin *H*. Screw *G* is then loosened, and plug *E* is removed, turned through an angle of 180 degrees, and replaced in body *A*. With lip *F* contacting a point in the under-cut diametrically opposite to the first one, screw *G* is again tightened, and distance *X* re-measured. A simple formula can be developed to determine the diameter of the under-cut from the two measured distances.

* * *

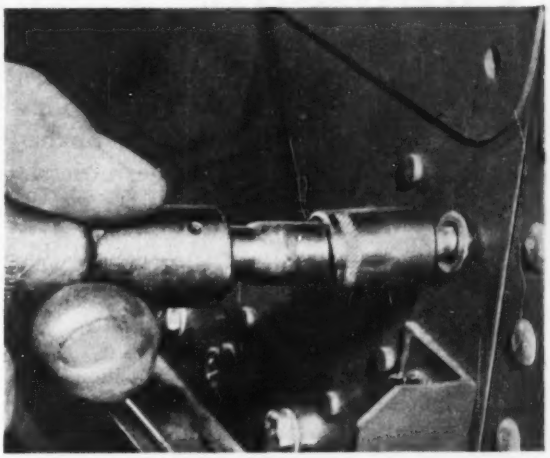
Life of Shear Blades Increased by Hard-Facing

The life of shear blades that cut metal billets up to 2 3/4 inches thick and 11 inches wide has been increased over four times by the use of welded-on facings at the Huntington Works of the International Nickel Co. Before this development, shear blades of a special type steel could cut up to 100,000 pounds of metal, depending on the alloy being processed. To increase this life, the blades were faced on the cutting edges by welding on Hastelloy "C"—an alloy containing 55 to 65 per cent nickel. This increased the life of the blades up to about 400,000 pounds of metal cut, also depending on the alloy being processed. Furthermore, it has been found possible to reface the blades time and time again. Some of the blades, with refacing, have been in service for over three years.

Hastelloy "C" has a hardness of 210 Brinell as deposited and is readily machinable. In service, however, deposits have work-hardened to between 325 and 400 Brinell, depending on the degree of temperature and impact. This increased hardness, of course, adds to the wear resistance of the surface.

Air-Operated Screwdrivers Save Time in Aircraft Plant

Spar webs are being installed in wing panels of Lockheed P2V Neptune planes by the Temco Aircraft Corporation, Dallas, Tex., with an estimated saving of six man-hours per panel through the use of air screwdrivers adapted for bolt driving. These screwdrivers were converted for bolt driving by welding a 3/8-inch square socket drive unit to the blade adapter of each screwdriver.



Driving a bolt in spar-web aircraft-wing panel with converted air-operated screwdriver

Previous to the development of the converted screwdriver by J. C. Kyser, a production employe of the corporation, hundreds of bolts were installed in each panel by using speed wrenches. Efforts to use air-driven nut runners proved unsuccessful, since variations in air pressure often resulted in driving the bolts beyond the required 100 to 110 foot-pounds torque. The bolts then had to be removed and new nut plates installed.

The screwdrivers have spring-loaded clutches which can be adjusted to cut-out at certain torque loadings. Thus it was possible to run the bolts down to approximately 90 foot-pounds torque and complete the tightening process with a torque wrench. The relatively low speed of the air screwdrivers facilitates proper starting of the bolts in the nut plates.

* * *

Nylon has many industrial uses, according to the Packard Electric Division of General Motors. Packard uses nylon for injection molding and insulating copper wire, and in the production of rollers for Frigidaire range drawers, lamp bulb bushings, and line-connector bodies.

Properties of Thermosetting Laminates Used in Postforming

Seventh in a Series, This Article Describes Formability, Physical Properties, Shape-Retaining Stability, and Testing of Thermosetting Laminated Plastics

By WILLIAM I. BEACH, Executive Assistant
North American Aviation, Inc.
Los Angeles, Calif.

ALL heat-cured and hardened resinous laminates can be postformed to a certain extent. The amount of residual formability and the postforming behavior of these materials depend upon the composition and manufacturing process utilized to laminate them. Naturally, since material manufacturers use different laminating varnishes and fabric fillers, materials of varying composition also vary in formability.

In the forming of laminates, the threads of the woven fabric are stretched, shortened, or relocated according to the intensity and direction of the force applied. It is this ability of the laminate to assume the varied shapes in which it is held by the resin, when the latter has returned to its original hard set after forming, that makes postforming possible. However, the method of heat-forming hardened and fully cured laminate sheet is of as great importance as its composition, and the temperature to which the sheet is subjected is particularly critical in obtaining maximum plasticity.

Laminates compounded from different types of resins and fabric fillers present a control problem in connection with time and temperature. An evaluation of laminates made by several manufacturers produced a scattered range of time-temperature operations necessary to obtain the optimum softening condition of the material.

The material manufacturers, in cooperation with the postforming development, investigated numerous combinations of resins and fillers in an effort to improve material formability. All postforming sheets modified in this effort were evaluated to determine what deviations were made, if any, from standard Grade C stock. Test specimens were taken from various sections of the sheet and checked for physical properties in the "as received" condition and in the postformed condition. For most materials, the physical properties of the part formed from flat sheet did not differ too much from the original sheet. In some instances, the strength of the postformed item was considerably improved by the process of postforming.

Moreover, considerable work was devoted to the testing of postformed material to determine the dimensional or shape-retaining stability of the part. There appeared to be a tendency on the part of some materials to exhibit good forming characteristics at the expense of their stable property. Such material was likely to be too thermoplastic, and while it readily accepted heat and formed easily, it also was inclined to lose shape under normal service conditions. The answer appears to be that the heat-resistant plastics are only relatively so, and raising their temperature does, in fact, soften them, thus permitting them to be worked, formed, and drawn.

Closely associated with this postforming requirement is the need for maintaining suitable drawing properties. It is assumed that when the resin is softened sufficiently, the fabric will stretch and shrink to the permissible deformation of the woven thread pattern. Hence, the selection of a fabric having uniform stretch in all directions is important. The foregoing properties of postforming material are the basic performance properties needed for standardization.

The physical property values that follow are considered the minimum allowable in order to obtain formed parts with acceptable service strength and dimensional stability. To determine these properties, exhaustive tests were made on material in the unstretched condition and in the stretched condition. The test specimens were elongated to represent postformed distortion of the material

Note: The Postforming Process is covered by United States and foreign patents, and pending applications are assigned to North American Aviation, Inc.

Tensile Strength and Modulus of Elasticity of Laminated Plastics

The average tensile properties of all thicknesses of material for the unstretched specimens at room conditions, or a temperature of 77 degrees F., were as follows: yield strength, 7400 pounds per square inch; tensile strength, 10,600 pounds per square inch; and modulus of elasticity, 1,250,000 pounds per square inch.

With a rise in temperature from 77 degrees F. to 165 degrees F., the average tensile properties of all material decreased:

Property	Unstretched Specimens	Specimens Stretched 5 Per Cent
Yield strength, per cent..	— 33.8	— 27.6
Tensile strength, per cent	— 13.3	— 12.6
Modulus of elasticity, per cent	— 39.4	— 32.1

Stretching all of the specimens 5 per cent increased the average tensile properties:

Property	At 77 Degrees F.	At 165 Degrees F.
Yield strength, per cent..	+ 14.8	+ 22.2
Tensile strength, per cent	+ 10.7	+ 11.4
Modulus of elasticity, per cent	+ 1.1	+ 11.8

There was only a very small percentage of average elongation for all specimens and the tensile properties of the 1/16- and 1/8-inch thick specimens were approximately the same. So far as ultimate compressive strength is concerned, this was found to be comparable to the requirements of Federal Specification HHP-256 for all materials. The average of the modulus of rupture for all materials varied with temperature as shown in Table 1.

The average Izod impact strength for all the materials was 24.7 inch-pounds per inch length of notch at room conditions, or a temperature of 77 degrees F. The impact strength increased with increases of temperature from minus 70 degrees F. to plus 165 degrees F. for all unstretched specimens and the average rate of change of the impact strength for all specimens was 0.05 inch-pound per inch length of notch for 1-degree F. change in temperature. The impact strength for the 1/16- and 1/8-inch thick laminated specimens was approximately the same for all material and there was very little difference in the impact strength for the warp and filler specimens. Stretching the 1/8-inch thick laminated warp specimens 5 per cent increased the impact strength between 4.5 and 29.1 per cent for all material at room conditions (77 degrees F. temperature).

As shown in Table 2, laminated sheet stretched on the bias will absorb less water than will material stretched on either the warp or the filler thread. When this material is stretched more than 2 per cent, it will absorb more water per unit of time than unstretched samples. Moreover, the greater the stretch, the greater the rate of water absorption.

Testing Laminated Plastics for Postforming

In testing the various laminated plastics, it was found that the length of time required in heating them for optimum formability varied as did the time intervals during which the material was formable without blistering or cracking. These inconsistencies in the materials indicated that the various thermosetting laminates should not be used at the same time for efficient production. Either the best material should be selected for production, excluding all others, or the material specification should be revised to enforce a more rigid control over the fabrics and resin used in the manufacturing process of the material. The minimum and maximum heat-

Table 1. Average Modulus of Rupture for Laminated Plastics at Various Temperatures, in Pounds per Square Inch

Specimen Type	Temperature					
	Minus 70 Degrees F.		Plus 77 Degrees F.		Plus 165 Degrees F.	
	Unstretched	Stretched 5 Per Cent	Unstretched	Stretched 5 Per Cent	Unstretched	Stretched 5 Per Cent
1/16-Inch, Warp	22,980	23,640	20,760	19,060	16,290	15,330
1/16-Inch, Filler	21,090	21,100	18,580	16,990	14,960	13,990
1/8-Inch, Warp	22,330	20,740	19,140	17,010	15,020	13,380
1/8-Inch, Filler	20,660	18,160	17,880	15,970	14,040	12,880

Table 2. Gain in Weight of Stretched Laminated Plastic Material Due to Water Absorbed at 77 Degrees F.

Direction of Stretch	Period of Immersion, Hours	Amount of Stretch, Per Cent			
		2.1	4.2	6.2	8.3
		Gain in Weight, Per Cent			
Warp Thread	24	1.6	3.6	4.4	5.9
	48	2.7	4.4	5.3	6.1
	120	3.9	5.4	5.8	6.5
Filler Thread	24	1.8	2.7	5.6	5.1
	48	2.8	3.8	6.3	5.9
	120	4.1	5.3	6.6	6.2
Bias	24	1.5	1.7	2.0	3.0
	48	2.3	2.7	3.1	4.2
	120	3.7	4.3	4.7	5.2

ing time for all the materials varied from 55 to 120 seconds for the 1/8-inch material with a 1/4-inch radius bend, and from 40 to 70 seconds for the 1/16-inch material with a 1/16-inch radius bend.

The time interval during which the material was formable without blistering or cracking (heating time spread) varied from 0 to 25 seconds for the 1/8-inch material with a 1/4-inch radius bend, and from 0 to 30 seconds for the 1/16-inch material with a 1/16-inch radius bend. Using a larger bend radius slightly decreased the minimum heating time, and increased the heating time spread. In order to include as many materials as possible, the heating time found for all materials tested was limited to between 40 and 60 seconds for 1/16-inch materials with a 3/32-inch bend radius, and between 80 and 120 seconds for 1/8-inch material with a 5/16-inch bend radius.

Following the postforming test, the specimens were examined for spring-back, or opening of the bend angle. Some materials tended to spring back considerably more than others, and in order to establish an acceptable allowable spring-back, it was determined that postforming material, after removal from the bending forms, should retain an angle of not over 93 degrees at normal room temperature. Further stability control was deemed necessary to insure the retention of shape under operating conditions wherein postformed parts may be exposed to hot, humid weather. The hot water test was included, and all materials successfully formed were heated by immersion in water at 180 degrees F. for one hour.

After being removed from the water bath and allowed to cool unrestrained, the test specimens were examined for spring-back. The amount of spring-back for all materials varied from 7 degrees to approximately 40 degrees for 1/16-inch thick material formed to a 3/32-inch bend radius. Materials ranging from 1/32 to 1/4 inch in thickness were subjected to this hot water test, and the maximum allowable spring-back consistent with other postforming requirements for a majority of the materials was established and tabulated.

In drawing these materials, the influence of the fabric upon the quality of the draw was extremely pronounced. Drawn specimens were not circular in shape; instead they were squared off, with the cup flange drawn mostly in the warp and filler direction, but only slightly in the bias direction. Similarly, failures were much more pronounced directly across the warp and filler threads than across the bias. All failures seemed to be tension failures of the threads.

Over half of the 1/16-inch materials drawn in accordance with the procedure set up for a cup draw test produced satisfactory draws of 1 inch depth. Thus, this depth of draw seemed to be the logical selection for minimum performance for 1/16-inch materials since a draw of less than 1 inch in depth would lead to the approval of materials whose comparative performance was consistently poor. While several materials produced satisfactory draws of 3/4 inch depth for sheets 1/8 inch thick, it was concluded that for best performance, a depth of 5/8 inch was more practical. The following draw characteristics were considered to be the minimum acceptable values for incorporation in a material specification: (1) 1 inch depth in 1/16-inch material; (2) 13/16 inch depth in 3/32-inch material; and (3) 5/8 inch depth in 1/8-inch material.

* * *

Defense Contractors Get Machine Tools from Schools

Critically needed machine tools worth several million dollars have been given to the Federal Government by schools and colleges. The equipment is being turned over to the National Production Authority, which allocates it to defense contractors and the Armed Forces.

Many of the machine tools were sold or given to the schools by the Government after World War II and currently are not being used to train students. The educational institutions ask only for reimbursement of the crating and shipping expenses. In the first five months of 1952, 1736 machine tools were offered to the Government, of which 1000 have already been turned over to NPA. The replacement value of the machines allocated is estimated at $1,955,443.



Overhead Handling Speeds Production at Caterpillar

By MASON W. HAIGH, General Manager
Cleveland Tramrail Peoria Co.

THE manufacturing plant which the Caterpillar Tractor Co. recently put into operation at Joliet, Ill., was planned for the manufacture of scrapers, wagons, hydraulic and cable controls, bulldozer blades and rippers. This auxiliary equipment is for use with tractors built at the Peoria plant of the company.

When the new plant was being laid out, the planning department spent many months working with its production and materials handling engineers to determine the best methods, equipment, and cycle of operations to achieve the required production. Along with the selection of the best types of actual production machinery, an exhaustive analysis was made of the materials handling problem, and a comparative study made of the company's production cost records using various types of materials-handling equipment. This indicated that in most of the manufacturing departments overhead cranes and monorail systems would save far more in handling costs than any other type of equipment.

There were two important factors which made this point apparent. One was that it has been proved through long years of experience with all types of handling equipment that, in many cases, overhead equipment was the most efficient because of its ability to lift, transport, and set down at its destination any type of load without rehandling. A major problem was to recover parts from final machining or sub-assembly operations and transport them to final assembly. Overhead equipment was the only type that could accomplish these results and, in addition, set and position the sub-assemblies during final assembly into the completed unit. Another factor was that the parts to be handled, being rather heavy and of such unusual sizes and shapes, were generally too unwieldy for any other type of equipment to handle economically.



Fig. 1. Simple monorail loop in cleaning and degreasing department passes over tanks containing various cleaning solutions and rinse baths

A unique idea in the extensive Cleveland Tramrail overhead system was that of using motor-propelled, floor controlled cranes on runways extending the entire length of the 920-foot bays, as a medium for transporting parts and sub-assemblies up and down the bays to other locations for subsequent operations. The building was designed with 80-foot wide bays, there being nine of these extending down the 920-foot length. Aisles, 12 feet wide, are provided down the center of each bay, and manufacturing and assembly operations are carried on in the 34-foot wide areas to either side. Several of the work areas are serviced by 32-foot long, two-runway, transfer type cranes on runways parallel to the aisle and extending in some bays the entire length of the building. These long-span, work area cranes are assigned to serve limited areas only for local handling, which includes the various lifts and short movements required, as well as supporting parts during certain assembly operations.

Depending upon the operations served, some of these cranes are hand-propelled and others motor-propelled. Movement of the motor-propelled cranes is controlled through push-buttons in the box on the control pendant of the electric hoist carrier. Likewise, some of the electric hoist carriers are hand-propelled along the girders and some motor-propelled. In all cases involving motor-propelled equipment—whether it be moving the cranes along the runway, the electric hoist carrier along the crane girder, or the up and down movement of the hoist hook itself—all motions are controlled by this same push-button box suspended from the hoist carrier.

Immediately over and on runways parallel to the aisle are a number of 14-foot long, motor-propelled transfer type cranes, with an interlocking mechanism at both ends. These cranes are arranged to interlock with the cranes servicing the work areas on either side, making one complete interlocking system. This permits moving a load from one work area to any other in the same bay without having to set it down and re-

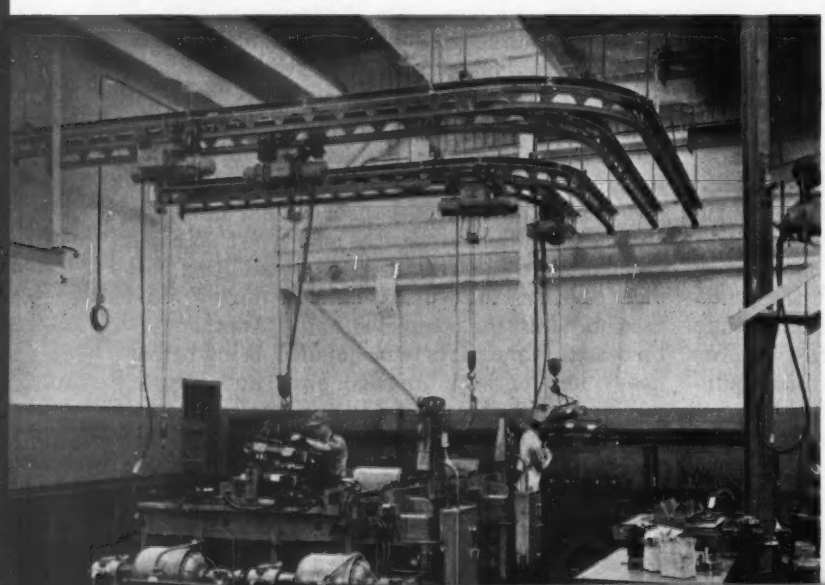


Fig. 2. Four parallel rails in this monorail system permit handling hydraulic cylinders from one operation to another in pairs, one cylinder per rail



Fig. 3. A 3000-pound bulldozer blade is easily and safely placed into a welding fixture by means of hand-propelled crane with electric hoist carrier

handle, and also to position a piece for the next operation. Thus, the short aisle cranes are used, in general, for the long hauls, and when necessary, for movement of materials across an aisle. With this arrangement, heavy and unwieldy parts can be moved between any two points in the entire 920-foot bay with the same hoist carrier, without rehandling.

There is an unusual arrangement of transfer spurs between several of the bays themselves which increases this flexibility because the carriers can be moved from bay to bay. All of the hoist carriers and control hook-ups are interchangeable, and function correctly wherever the carrier may be moved. A typical application may be seen in the heading illustration, which shows a general view of one of the 34-foot wide work areas serviced by hand-propelled interlocking cranes. A 14-foot long motor-propelled crane system, seen at the right above the aisle in the center of the bay, interlocks with crane systems over work areas on either side.

In some of the work areas there is the problem that the majority of loads handled are comparatively light (under 3 tons). Quite frequently, it is necessary for such loads to be suspended for some time during the operation, thus tying up the hoist. It also happens that there is the occasional need for handling loads up to 10 tons in the same area. To solve this problem, a conventional overriding, 10-ton capacity, floor controlled crane system covering the entire bay was installed to handle the heavier loads.

Under this crane, covering the work areas only, a number of single-leg, motor-propelled gantry cranes were installed, which were equipped with motor-propelled electric hoist carriers. The upper end of each of the gantry girders is supported from a single Tramrail runway suspended from one of the conventional crane runways, and the other end supported by the gantry leg, running on an industrial rail set in the floor along the edge of the aisle. This permits all normal, local handling operations to be performed by the gantry cranes, and at the same

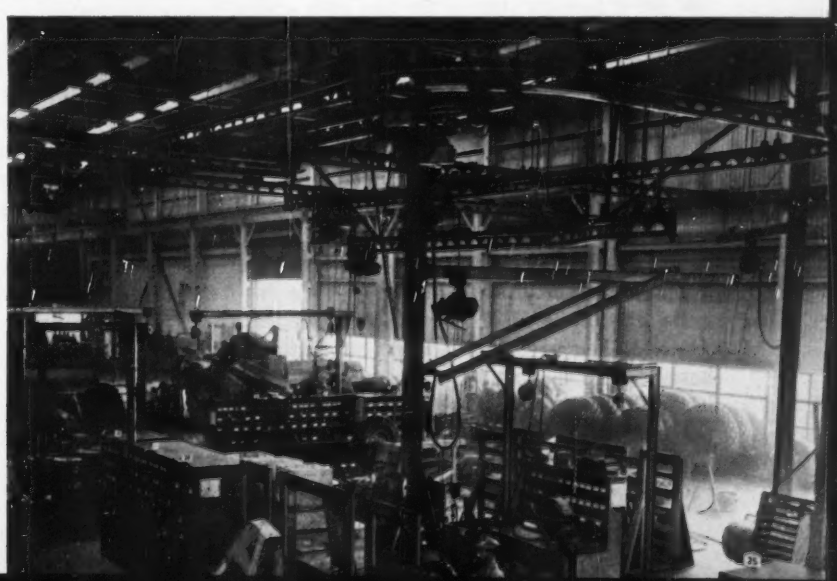


Fig. 4. A U-shaped track in this monorail application permits giant tires to be brought to the assembly conveyor

time the heavier duty conventional crane is always available for use, as there is no interference at any time between the two types of cranes. On these units all motions of the crane and hoist are controlled from the pendant of the hoist carrier.

Monorail systems are used extensively in departments where there is a set and predetermined flow of materials or parts being processed. A typical application is shown in Fig. 1, which is part of the cleaning and degreasing department. Here the tanks containing the various cleaning solutions and rinse baths are arranged in two rows, and a monorail loop is installed directly over the center of the tanks. The hand-propelled electric hoist carriers on the Tramrail loop permit rapid and safe handling of materials through the cleaning operations, whether the parts are in baskets or handled individually.

Another use of a monorail is illustrated in Fig. 2, which is a view of a corner of the hydraulic testing department, where cylinders are processed in pairs through progressive tests. Here, with a lay-out of four parallel rails, cylinders are handled from one operation to another in pairs, one cylinder to a rail, without manual lifting. This application illustrates the extent to which Caterpillar has gone to remove manual lifting, even when relatively light loads such as these cylinders are involved. To raise the cylinders from the stands manually would require awkward lifting that might result in serious injury to the employe.

Also of interest is the monorail application in final assembly, Fig. 4, where a U-shaped track enables giant tires to be brought to the assembly conveyor line. This track and crane, operating over the conveyor overlap, makes it easy for the crane to pick up tires brought in on the U-track and support them during mounting on the scraper units.

Exclusive of the structural steel used in the erection of the superstructure of the plant, the standard materials-handling equipment consisted of almost five miles of Tramrail arch-beam and rail sections for the crane runways and monorail systems. Approximately 200 hand-propelled, two-runway cranes, 25 motor-propelled, two-runway cranes, and 15 motor-propelled, single-leg gantry cranes were put into service. Also, 200 hand-propelled, electric hoist carriers and 40 motor-propelled, electric hoist carriers were required. The hand-propelled crane with electric hoist carrier seen in Fig. 3 permits the operator to easily and safely place 3000-pound bulldozer blades into a welding fixture.

It is interesting to note that in this entire installation not a single piece of special equipment was necessary. All units making up the complete system were standard catalogue parts, combined to fit the particular requirement or application. Such adaptation of standard equipment and parts, together with the fact that all crane girders, runway beams, and hangers were prefabricated at the factory to fit, made the erection relatively simple.

New Process Converts Mica Flakes into Usable Sheets

THE United States soon may no longer depend on a foreign source for the bulk of its mica requirements. At present, more than 90 per cent of this critical electrical insulating material is being imported, principally from India. At the recently completed pilot plant of the Integrated Mica Corporation, Woodmere, N. Y., man-made pure mica is now being produced. The process utilizes the mica waste which can be mined in large quantities in different parts of this country.

The key piece of apparatus in the process is a disintegrator that splits the waste into millions of flakes less than four microns thick. These flakes are then floated out into a water bath, where they settle on a conveyor belt which is afterwards run through a dryer. As they dry, the flakes adhere to each other and form a solid sheet of mica. The material can be given various degrees of porosity, or can be made highly water-resistant by being impregnated with resins.

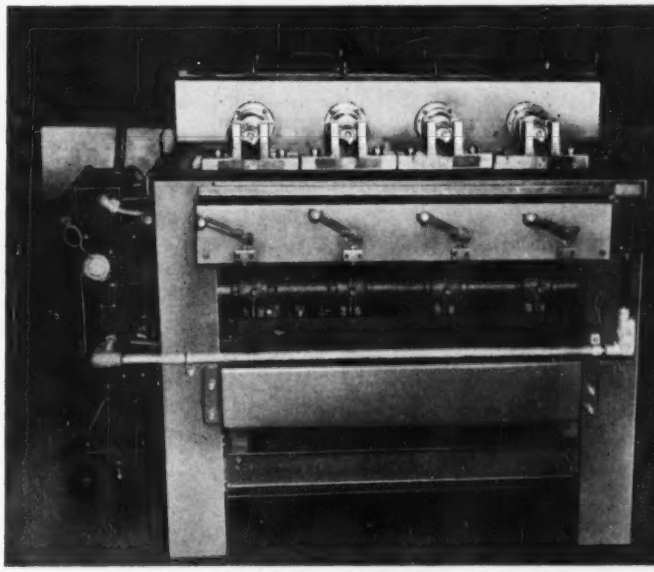
Mica scrap developed synthetically in a government laboratory has also been processed in the pilot plant. Synthetic mica, being reactive to heat, has an advantage over the natural material. When heat and pressure are applied to synthetic mica, it is sintered, and strong porous sheets can be obtained. If the temperature is raised to the melting point, the mica recrystallizes and a sheet that is transparent in its thin form can be made.

* * *

More than 35,000 separate tools are required to build a modern patrol bomber.

Railway Air-Valve Cocks Finished on Special Lapping Machine

By ROBERT W. NEWTON
Poughkeepsie, N. Y.



TAPERED seats in railway air-valve cocks must be finished smooth and to a high degree of accuracy in order to prevent the escape of compressed air. To obtain this fine finish it has been found necessary to perform a final lapping operation in which the tapered plug of the air valve is lapped into the tapered seat in the cock body.

The tapered plugs are first accurately turned to a smooth finish. If the tapered seats in the cock bodies could also be machined sufficiently smooth, the costly lapping operation would be eliminated. However, various processes for machining these tapered holes have been tried without too much success. Several manufacturers have made special cock grinding machines on request, and smooth surface holes are produced in this way. Although final lapping can sometimes be eliminated, it is often necessary to lap the tapered plug into the ground cock body to produce an assembled cock that will operate satisfactorily. Precision boring has also been tried, but it is still generally necessary to finish by lapping.

Railroad repair shops and the air-valve manufacturing companies usually design their own equipment for performing this lapping operation. Front and rear views of such a special

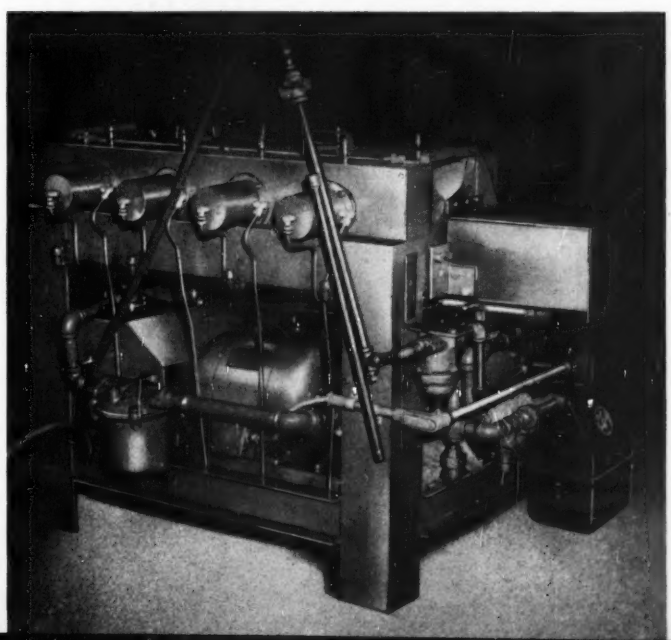


Fig. 1. (Above) Front view of a special four-spindle, hydraulically controlled and air-operated machine for lapping tapered seats in railway air-valve cocks

Fig. 2. Rear view of the lapping machine seen in Fig. 1. Each of the four spindles is equipped with an independent air cylinder to engage the clutch.

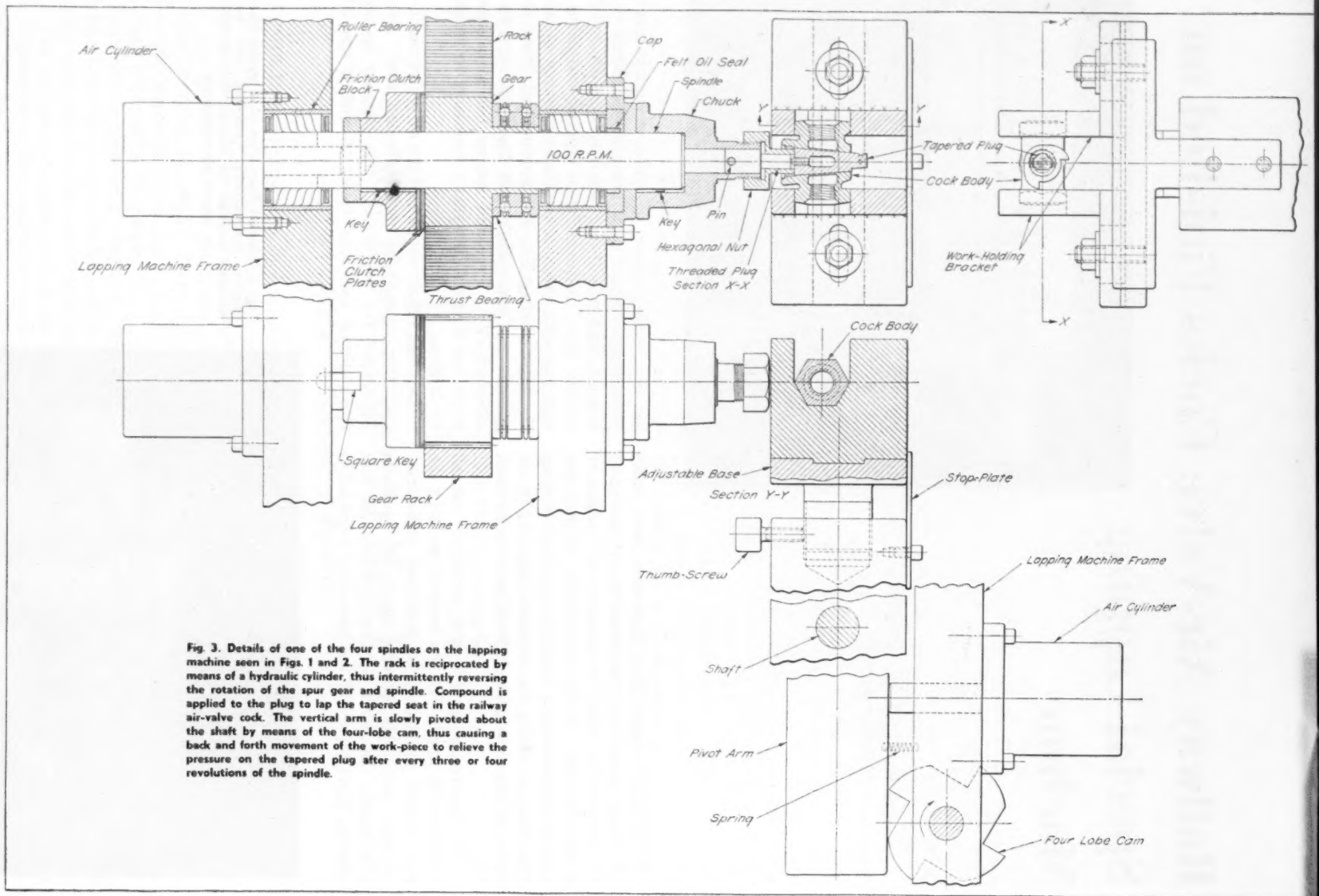


Fig. 3. Details of one of the four spindles on the lapping machine seen in Figs. 1 and 2. The rack is reciprocated by means of a hydraulic cylinder, thus intermittently reversing the rotation of the spur gear and spindle. Compound is applied to the plug to lap the tapered seat in the railway air-valve cock. The vertical arm is slowly pivoted about the shaft by means of the four-lobe cam, thus causing a back and forth movement of the work-piece to relieve the pressure on the tapered plug after every three or four revolutions of the spindle.

machine are seen in Figs. 1 and 2. This four-spindle, hydraulically controlled and air-operated lapping machine was designed by Charles L. Fluno and built at the New York Air Brake Co., Watertown, N. Y. The cross-sectional drawing, Fig. 3, indicates how each work-piece is held in place, and shows detail arrangements of one of the four lapping spindles.

Design Features of Lapping Machine

Each air-valve cock body is supported between a pair of welded work-holding brackets which are fastened to the top of an adjustable base. Elongated stud clearance holes are provided to permit moving the brackets apart or together for various size cocks. Tongues on the under side of each bracket fit into a groove in the top face of the base for accurate alignment. Each bracket is cut out to fit loosely the hexagonal-shaped ends of the cock body as seen in section *Y–Y*. The cut-outs extend up to the top of the brackets, thus permitting the cocks to be reciprocated without being raised or lowered.

The four adjustable bases are screwed into the top of a vertical arm which is slowly pivoted about a shaft by means of a four-lobe cam. The bases can be raised or lowered to accommodate various size cocks, and then locked in place by means of thumb-screws. A stop-plate that prevents movement of the adjustable base caused by the pressure of the rotating tapered plug is fastened to the side of the vertical arm.

The slow, short, back and forth movement of the work-piece relieves the pressure on the tapered plug after every three or four revolutions of the spindle. For unloading and reloading, the pivot arm is swung back on its shaft by means of an air cylinder fastened to the lapping machine frame, thus sliding the cock body off the tapered plug. When air pressure on this cylinder is released, a spring pulls the pivot arm back to the position shown, thus sliding the work onto the plug.

The tapered plug of the air valve is screwed on a threaded plug that is pinned to the bore of the chuck. A special hexagonal nut, threaded on the end of the chuck, is turned tightly against the end of the tapered plug. This facilitates removal after lapping, since the nut can be backed off slightly and the tapered plug spun off the threaded plug. Without the nut, the tapered plug might become jammed against the face of the threaded plug, and it would be difficult to remove.

The chuck is bored, and is provided with a key to fit the end of the spindle which rotates in two roller bearings. Rotation is obtained by means of a spur gear (freely mounted on the spindle) that meshes with a rack. The rack is reciprocated by a hydraulic cylinder, the pressure of which is pre-set to obtain a spindle speed of 100 R.P.M. Rotation of the spindle is reversed after each complete revolution.

A friction clutch plate is fastened to the rear face of the spur gear, and an engaging plate is secured to a friction clutch block that is keyed to the spindle. The clutch plates are engaged or disengaged (to start or stop rotation of the spindle) by means of an air cylinder fastened to the back of the lapping machine frame. When the cylinder is actuated, the piston rod—which extends through a hole in the end of the spindle—pushes against a large square key to engage the clutch and rotate the spindle. This square key is driven into the end of the clutch block, and slides in a clearance slot machined in the spindle. A thrust bearing, located between the spur gear and the lapping machine frame, prevents the pressure exerted on the clutch plates from being transmitted to the chuck and the work. The spindle, chuck, and tapered plug stop rotating as soon as pressure against the square key is removed.

A push-button is depressed to start the motor-driven pump that operates the hydraulic cylinder. This reciprocates the single rack which intermittently reverses the rotation of the four spur gears. Both air cylinders at each spindle—the one that engages the clutch and the one that pivots the long vertical arm—are actuated by a lever mounted on the front of the machine. In this way, each spindle can be operated independently, and when one cylinder is opening, the other closes. When the levers are moved to the right, the pivot arms are swung back to the unloading and reloading position. In this position, a tapered plug can be screwed on the threaded plug, the special hexagonal nut tightened, and lapping compound brushed onto the tapered plug.

When a cock body has been placed in the cradle formed by the slotted work-holding brackets, the operating lever is swung to the left, the body sliding onto the tapered plug, which begins its reversing rotary motion. About every three or four revolutions of the plug the valve body will move back and forth slightly as the four-lobe cam rotates slowly against the lower end of the pivot arm.

Since each spindle can be operated independently, the operator can continuously load and unload work-pieces. If any part needs extra lapping, the spindle can be stopped and more compound brushed on the tapered plug. Then the lapping operation can be repeated until the desired finish is obtained on the tapered seats.

192—MACHINERY, September, 1952

Tractor Joined by

By
STEPHAN CHMIELEWSKI
General Welding Foreman
Tractor Works
International Harvester Co.

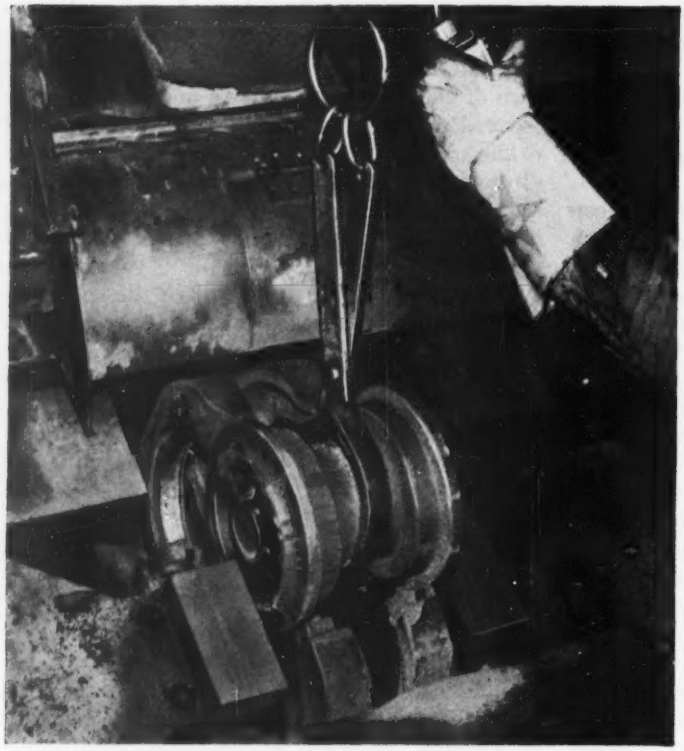


Fig. 1. A track roller is here illustrated being removed from machine after butt-welding the hubs of two forgings together.

TRACK type tractors built by the International Harvester Co. at its Chicago, Ill., Tractor Works require forged track rollers of spool-like shape. One of these components is shown in the left-hand view, Fig. 2. Because of its shape, the roller is made up of two identical halves, the hubs of which are butt-welded together to form a barrel. A central hole which is later machined runs through the roller.

For the welding operation, the two halves are clamped in Elkonite dies, and then pressed together under a pressure of 500 pounds per square inch. In welding, about 1/4 inch of the hub is flashed off. Some of the metal burned off in the flash is forced outward and some inward radially. The flash that issues outward causes no particular trouble. It is either caught by a spark-arresting guard, or gathers around the joint, as can be seen in the illustration, and can be easily ground off. The metal forced inward,

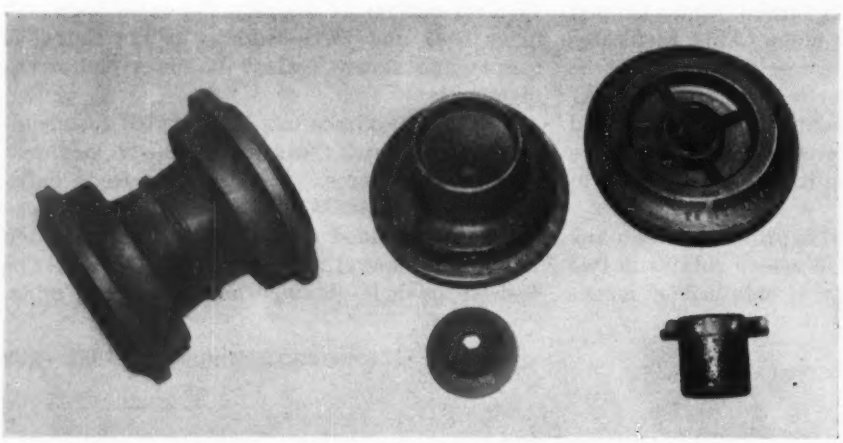


Fig. 2. A forged roller is shown after butt-welding in view at left. A core and a spider are seen separately and in position at center and at right, respectively.

Forgings Welding

however, forms a slag which proves troublesome to cutting tools used subsequently in machining the hole.

To prevent this slag formation in the hole, two sand cores are inserted, one in each of the forged halves, prior to welding. In the center views of Fig. 2, one of the hat-like cores is shown separately, and also in position in one of the forgings. The tubular portion of a steel spider, shown in the right-hand views, centralizes the core. The cores cover most of the interior surface of the forgings. When the two halves are assembled for welding, there is space between the cores into which the flashed-off slag can flow. The pressure on the halves during welding causes this space between the cores to diminish, and the cores nearly meet when the weld is completed. Consequently, very little of the bore of the roller is exposed to the slag. In Fig. 1 is shown one of the rollers being removed from the machine, a 500-K.V.A. Taylor-Winfield butt-welder.

After welding, the roller is transferred to a press in which a punch is forced through the hole. This action breaks up the cores and pushes out most of the sand along with the slag. Compressed air is used to remove any remaining sand. Then the forgings are heat-treated before being machined. Some labor is entailed, of course, in making the cores and putting them in position, yet the average welding speed is 15.7 pieces per hour. Moreover, the longer tool life realized as a result of this practice more than offsets the core cost.

Another tractor forging that requires welding is one known as a track guide frame. It is a U-shaped part which, after being drop-forged flat with a 1 1/2-inch diameter boss near each end, is bent to a V-shape in a press and then to a U-shape in a bulldozer. This operation brings the two bosses into line with their ends nearly touching. It is then necessary to arc-weld the two bosses together, as shown in Fig. 3, thereby making a closed loop of the forging.

As a preparatory step, the bosses are preheated with a gas flame. Arc-welding is done manually with Westinghouse equipment. A coated rod (No. 11, A. O. Smith) 1/4 inch diameter is used to produce a single 3/16-inch bead. The design of the fixture incorporates a counterweight and the work-piece is rotated slowly about the boss axis during welding, thereby permitting a continuous bead to be laid down. About 5.7 pieces per hour are completed.

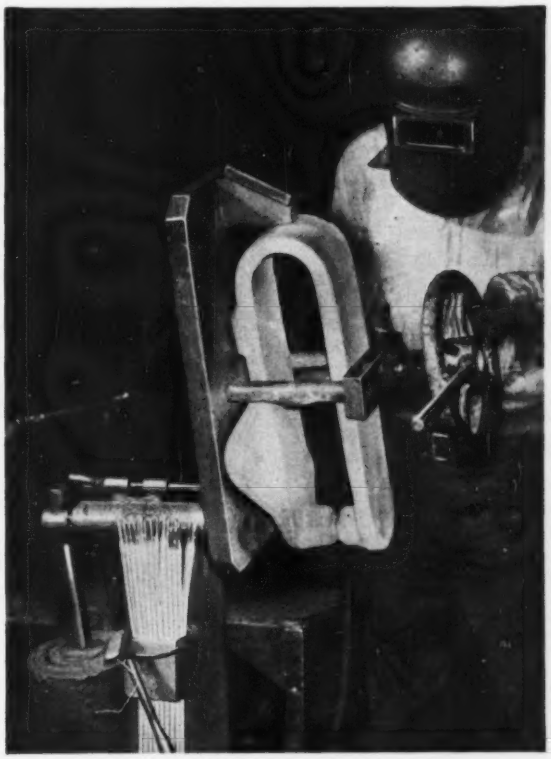


Fig. 3. Set-up in a welding fixture which permits a continuous bead to be laid down around two bosses on a track guide frame as it is rotated slowly

* * *

Nations Agree to Unify Various Engineering Standards

Recently, Dr. John R. Steelman, acting director of the Office of Defense Mobilization, announced that a permanent organization to devise unified engineering standards has been agreed upon by the United States, Canada, and Great Britain. As a result of the agreement, permanent committees were named on all major items under study for standardization, including drafting standards and practices, screw threads, pipe threads, threads and fittings for gas cylinders, and fits and tolerances.

The standardization of drafting practices was considered particularly important because it will make drawings mutually understandable, and result in savings of considerable manpower hours. The committees are scheduled to report at a meeting set for October 14, 1952.

Mammoth Simplify

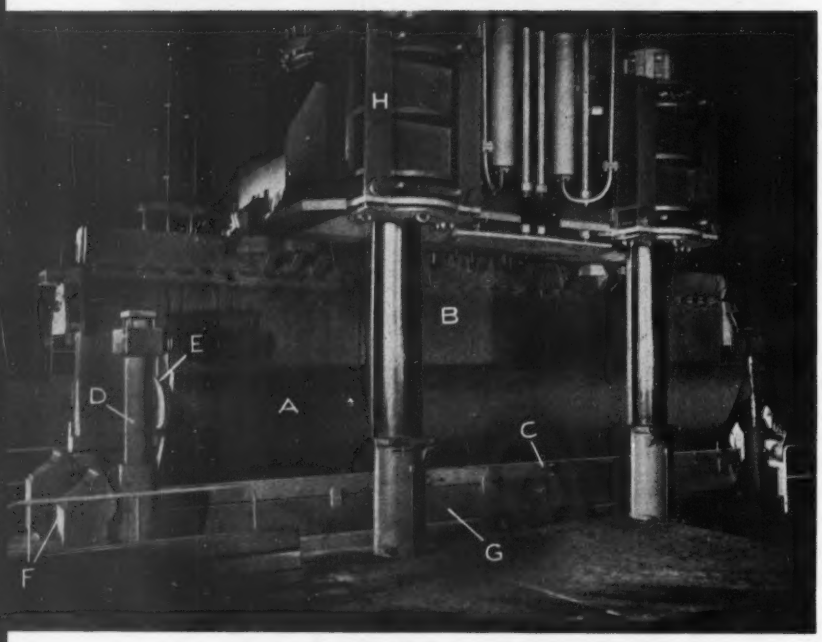
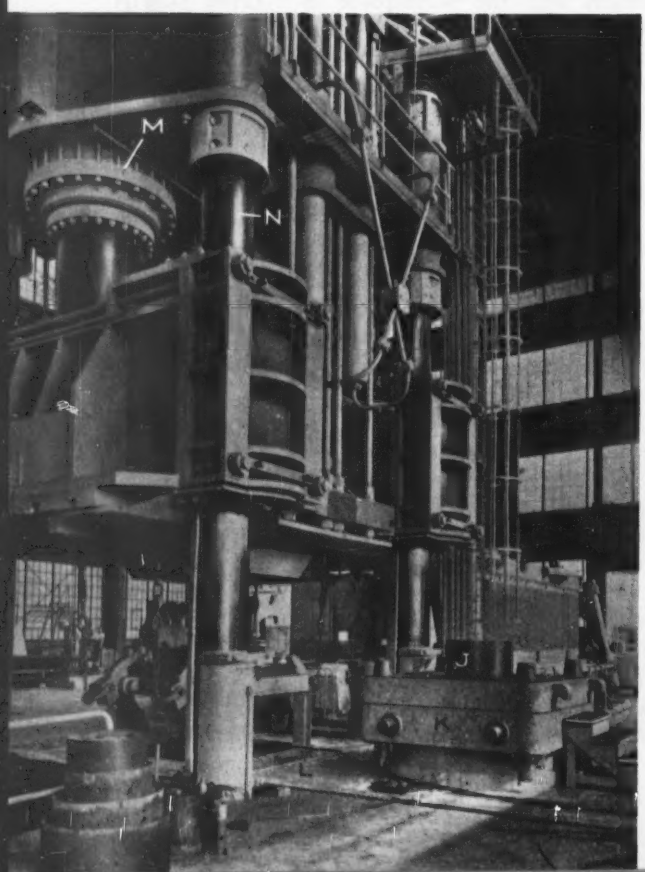


Fig. 1. The heaviest plate ever rolled—6 inches thick, 10 feet wide, and 37 feet long, weighing 43 tons—being formed into a section for a boiler drum.



BENDING the heaviest steel plate ever rolled, and piercing and drawing huge steel billets into hollow forgings by a method that is unique in the United States are now vitally important fabricating techniques in the manufacture of steam boilers at the Barberton, Ohio, Works of the Babcock & Wilcox Co. As the nation's largest supplier of steam generating equipment, B & W will figure prominently in expanding the capacity of American electric utilities some 40 per cent in the next three years. Increased capacity will be evidenced not only by the number of power plants that are to be erected, but also by the efficiency of the boilers in these new plants in producing more kilowatts from a given amount of fuel. Greater boiler efficiency requires higher operating temperatures and pressures. Drums and headers have to be heavier, tubes of better alloys, refractories more stable—in other words, practically every part of the boiler has had to be redesigned.

Two new multi-purpose machine tools that are making possible fast and economical production of vital boiler parts are a vertical press and a horizontal draw-bench. The press bends heavy plate for boiler drums, and also pierces steel billets which are then transferred to the draw-

Fig. 2. With the bending beam detached and moved to one side, the press is used for billet

Hydraulic Press and Draw-Bench Steam Boiler Production

bench to be formed into hollow forgings for boiler headers and other special parts. Figs. 1 and 2 are close-up views of the press, and Fig. 4 is a close-up view of the draw-bench.

Boiler drums for high-duty central station units are fabricated by welding together a number of curved heavy plate sections. One of these plates *A*, Fig. 1, is 6 inches thick, 10 feet wide, 37 feet long, and weighs 43 tons. This plate is being formed to the required curvature of the drum by a 100-ton bending beam *B* working over a radius die *C*. The curvature is generated by repositioning the plate sidewise between successive strokes of the press. This is done by four hydraulically operated manipulators *D* located near the corners of the plate. Hooks *E* on the manipulators engage rings which are an integral part of the ends of the plate.

All movements of the manipulators can be controlled from any one of six stations *F* (two are visible). Push-buttons at the stations institute movements by energizing solenoids, which, in turn, actuate air pilots on hydraulic pressure lines. As a safeguard, the manipulator controls are interlocked with the stroking cycle of the press.

Because of its thickness, the plate is rough-formed hot. For this operation it is heated and soaked at 1875 degrees F. for two hours in a new furnace built near the press. After the plate has cooled to room temperature, it is finish-formed, using the same bending beam and radius die. (Plates up to about 2 3/4 inches in thickness are formed cold, in their entirety.) Since this press makes it possible to bend longer plates than heretofore, fewer plates are needed in the

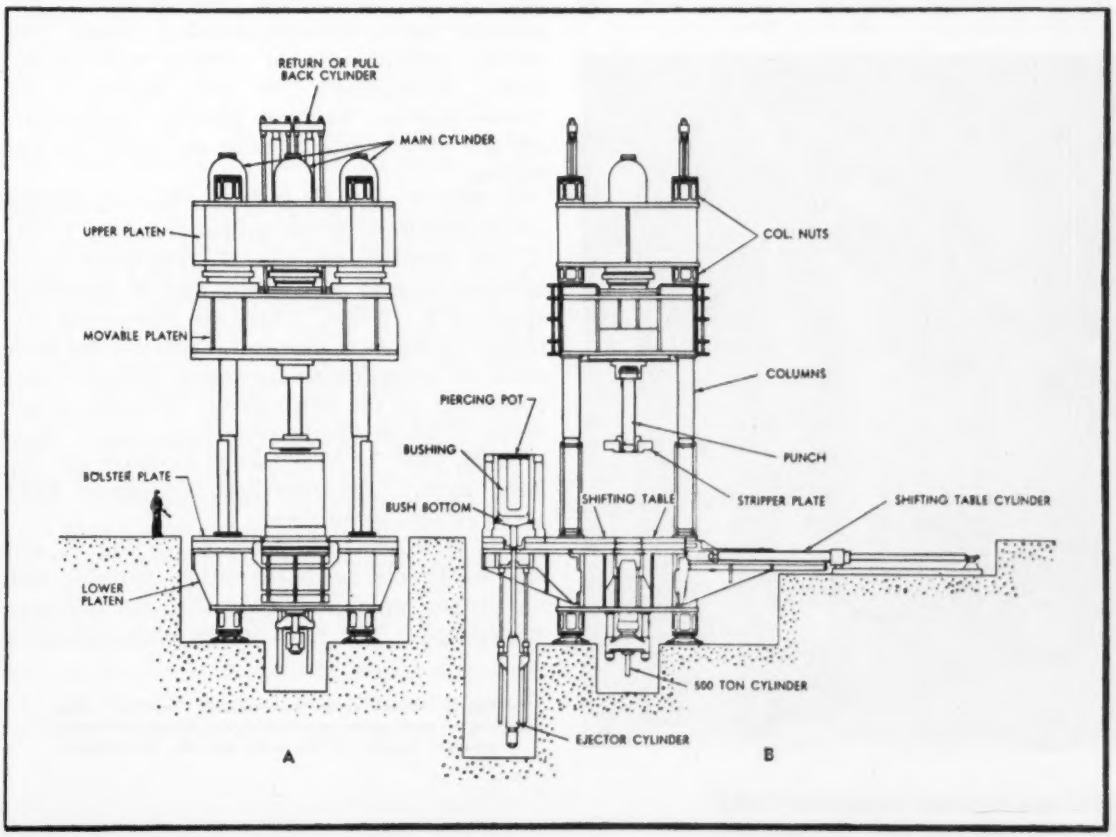


Fig. 3. Cross-sections of the new vertical press, as seen from the front (A), and left side (B).

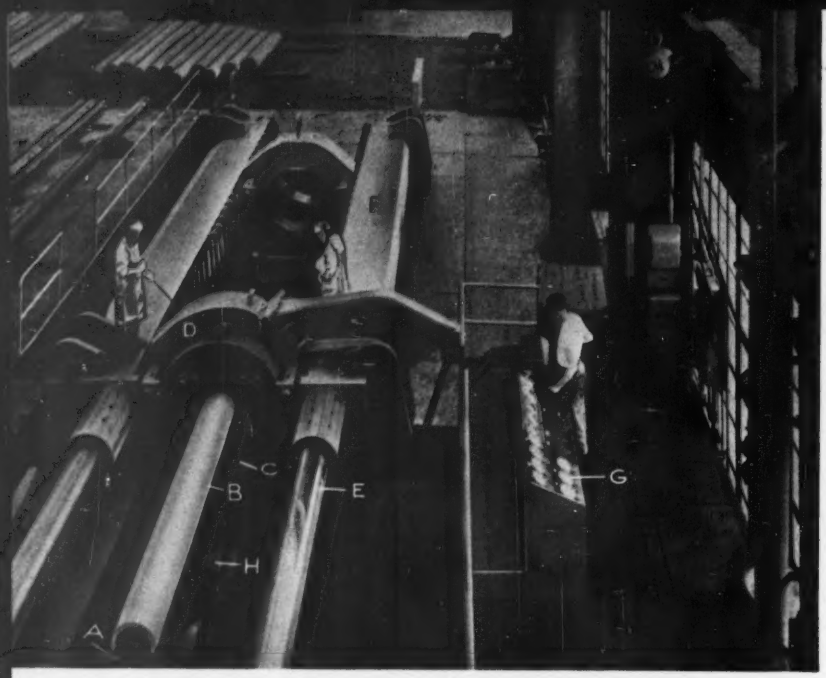


Fig. 4. This horizontal draw-bench, the first of its kind in the United States, is used to form the hollow forgings shown in the background.

new steam drums, with a subsequent reduction in the number of circumferential welds required, as well as a saving in time and cost. Furthermore, since fewer welds are necessary there is an additional and substantial saving in X-raying the welds to test their soundness.

The carriage *G* on which the radius die is supported has a cross travel of 52 feet through the press to load the flat drum plate coming from the furnace, and to unload the plate after it has been bent. For this movement, the foundation houses a 16-inch bore hydraulic cylinder and ram. When not being used, the bending beam is detached from the movable platen *H* and is accommodated on the carriage, which is then moved away from the press. This location of the beam and the carriage can be seen in the background in Fig. 2.

As may be seen from the illustration, the press is used for piercing a billet *J* (brought to forging temperature) loaded in a piercing pot, or matrix, *K*. After the stripper plate has been installed, the table *L* supporting the matrix is hydraulically shifted to a central position beneath the movable platen, through which a punch (not visible) descends for the stroking cycle of the press. Subsequently, the table returns to its former position, where an ejection cylinder under the matrix acts to raise the billet for unloading.

In Fig. 3 are diagrammatic representations of cross-sections of the press—from the front, *A;* and from the left side, *B*. The press has a daylight opening of 20 feet, and an operating stroke of 9 1/2 feet. There are three main cylinders, 45 inches in diameter. Provision has been made for pressurizing the center cylinder independently, or the two outside cylinders, or all three cylinders simultaneously, so that a force of 2100, 4400, or 6500 tons is available for the down stroke. An intensified pressure of 8500 tons can also be obtained.

The three main cylinders *M*, in Fig. 2, are steel weldments, as are the bottom, movable, and top platens, which weigh 130, 200, and 115 tons, respectively. The rams in the main cylinders



Fig. 5. These seven accumulator "bottles" store the air and water required by the hydro-pneumatic pressure system for the press and the draw-bench.

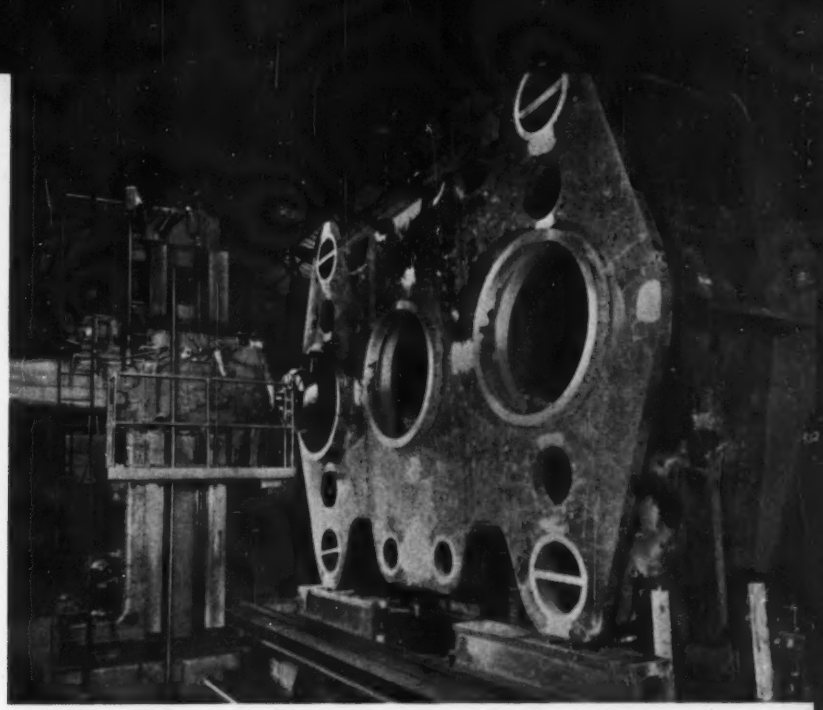


Fig. 6. The bore for one of the main cylinder rams of the press is shown being machined on an 8-inch spindle horizontal boring mill.

are cast iron, 43 1/2 inches in diameter. Four columns *N* form the vertical framework of the press. They are 52 feet high and are located on 16-foot centers, side to side, and on 14-foot centers, end to end. Two 12-inch diameter balancing cylinders and two 12-inch diameter pull-back cylinders are provided. To pierce manholes in the lower ends of drum heads, a 500-ton ram, 22 inches in diameter, having a 54-inch stroke, is located centrally in the pit below the bottom platen, as can be seen in Fig. 3.

After a billet has been partially pierced on the vertical press and while it is still at forging temperature, it is transferred to the horizontal draw-bench, Fig. 4. Here, a mandrel *A* is inserted in the pierced center of the billet *B*, which is then drawn through a ring die *C* supported in a die-holder *D*. This operation elongates the billet and reduces its outside diameter. Subsequent drawings through smaller dies give the billet further elongation and diameter reduction. For example, a solid octagonal billet, 46 inches across the flats and 68 inches long, can be finished (after rough-piercing in the vertical press) on the draw-bench to a hollow, round forging 31 inches in outside diameter and 22 feet long, with a wall thickness of 2 1/2 inches.

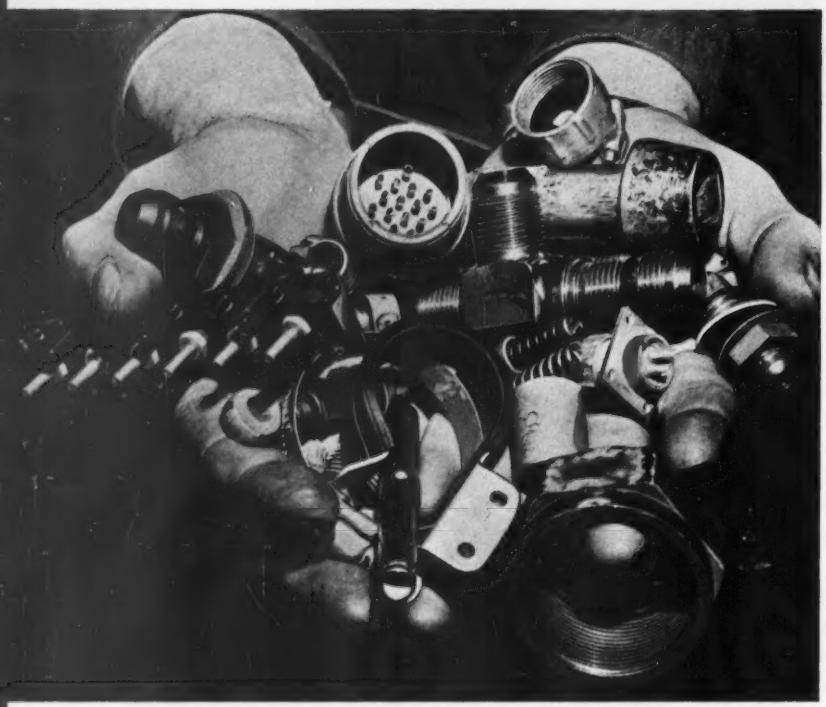
Previously, it was necessary to make such objects from steel plate rolled and welded at the seam, or from a solid forging by boring out the center. Various shapes of mandrels and dies, other than round, can be used on the draw-bench to obtain different cross-sections, such as squares, rectangular shapes, "D" shapes, and ovals. Because the special tooling can be set up quickly, it is practical to use the draw-bench for one or two lengths of a particular size at very little unit cost for the changeover, thus providing great flexibility in manufacturing operations. Under the older methods, it was not economical to produce hollow forgings of the type described in runs of less than 350 feet of a particular material and size.

The draw-bench has an over-all length of 114 feet and a main cylinder bore of 32 inches. Tie-bars *E* are 16 inches in diameter and 84 feet long. Die-holders can be stationed along 28 feet of the 31 1/2-foot length of the die bed *F*, to suit the length of the drawing. An operator at a panel *G* controls the hydro-pneumatic pressure system by which the movements of the draw-bench are made. Switches on the panel are used to raise and lower a series of rollers *H* which act to support the forging on the center line of the die.

The hydro-pneumatic pressure system that operates both the press and the draw-bench is powered by three triple-piston single-stage pumps, individually geared to a 500-H.P., 2300-volt synchronous motor. Each pump has a delivery rate of 234 gallons per minute at 3000 pounds pressure. In Fig. 5 is shown the accumulator plant—two water and five air "bottles"—which provides the necessary large high-pressure storage capacity.

All of the weldments for both the press and the draw-bench, as well as most of the other components of these machines, were constructed at the Barberton Works. The three press platens are believed to be the largest ever made of steel weldments. Their fabrication required precise control—preheating for welding, and stress-relieving prior to machining. Fig. 6 shows how the 200-ton movable platen was machined on an 8-inch spindle horizontal boring mill. Built in the drum shop, the platens were transported to the new press and draw-bench building on a specially built short line railroad.

Boeing Efficiency Starts



Display of rejected parts in company newspaper helps conservation committee dramatize high cost of scrap.

EVEN without considering the reduced value of today's dollar, the taxpayer is getting much less for it, in terms of aircraft quantity, than he got during World War II. One reason, of course, is that production volume has not been high enough to lower the cost per unit. A second is that, as science has advanced, the research, design, and manufacture of aircraft have become increasingly complex and costly. Uncle Sam must keep up with this expensive parade; he can afford it much better than he can afford to turn out a second-rate product. In air power, as in poker, second best is little better than nothing at all.

Although aircraft prices will remain sky-high for the foreseeable future, this is no excuse for throwing up the hands in despair. It is all the more reason for employing careful and thorough means for whittling down costs wherever possible. In this respect, taxpayers will be gratified to learn of the emphasis placed on cost cutting by the Boeing Airplane Co., Seattle, Wash. Essentially, Boeing's successful program of cost control can be attributed to a frame of mind—cost consciousness. From the office of President William M. Allen all the way down to the man with the rivet gun, this frame of mind has been carefully nurtured during the past several years. The most dramatic savings thus far have been in B-50 and C-97 production, where the cost control program has enabled Boeing to underrun its estimates by many millions of dollars.

One of the most recent and promising cost control measures has been the establishment of a budget control committee for the Seattle Division. In a sense the committee's function is a psychological one: the further development of cost consciousness. Made up of five members of top management, the committee meets with department heads to work out reasonable budgets, and monthly performance reviews keep it informed on how the departments are doing, dollar-wise. The man who is exceeding his budget faces a personal appearance before the committee. Actually, of course, the company recognizes that there are sometimes good reasons for exceeding a budget. A department head may present those reasons to the committee, and if they appear plausible he will receive approval for deviating from his budget. More often, however, the department head is likely to try to stay under his budget.

At both the Seattle and Wichita Divisions, the cost accounting department gets together with shop people and industrial engineering personnel to establish targets for specific jobs. These targets are set up in terms of man-hours per unit and are usually referred to as "bogeys." From this point on, reports go out regularly to each shop to show how its actual man-hour expenditure compares with its "bogey."

For assembly jobs, the "bogeys" are usually set up on the basis of what is known as a normal improvement curve. This calls for a specified percentage reduction in man-hour costs whenever a production lot is doubled. On tooling, quantity of production usually is a lesser factor. Man-hour estimates for tool fabrication accompany each individual order to the shops for construction of a major tool.

A somewhat different type of document issued by cost accounting is the rework and scrap re-

port. This report constitutes a monthly evaluation of all work that has been rejected for faulty workmanship or other causes, and it is watched closely by superintendents and even by the vice-president in charge of manufacturing.

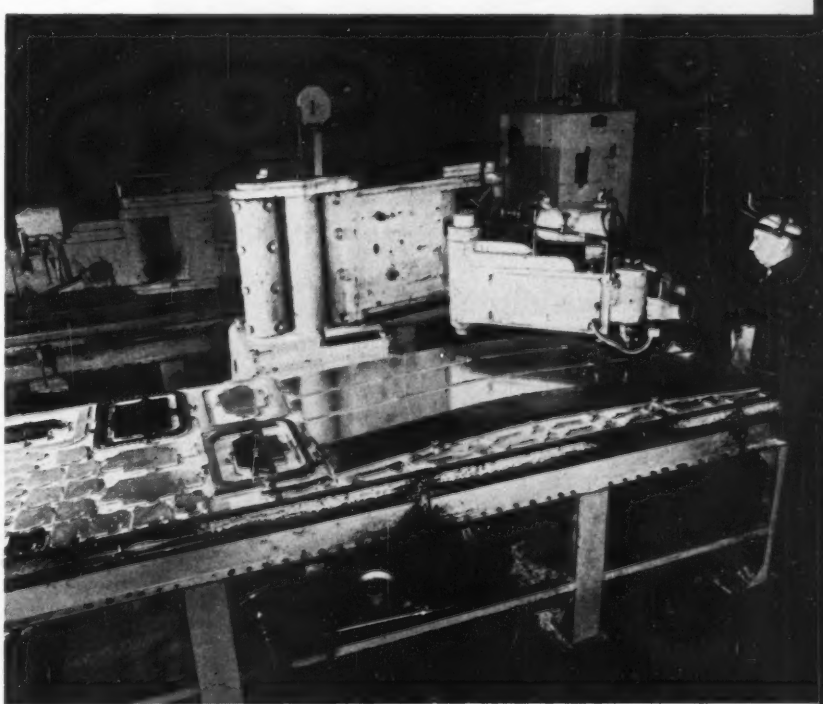
Another big factor in reducing waste has been the Seattle Division's material conservation committee. For the most part, this committee has pointed its finger at many specific items of waste through the pages of the *Boeing News*, the company's employe newspaper. A film—"Let's Stop Waste"—has done an excellent job of making employes aware of the large losses carelessness can cause. The picture illustrates how failing to clean a paint brush ruins it, how using too much mask tape or dropping rivets is wasteful, etc. Graphic representation of the cost of tool breakage in one department is shown by a panel on which are mounted the broken tools turned in during one week.



Aluminum chips are briquetted and sold. More than 3,000,000 pounds of aluminum were salvaged in 1951.

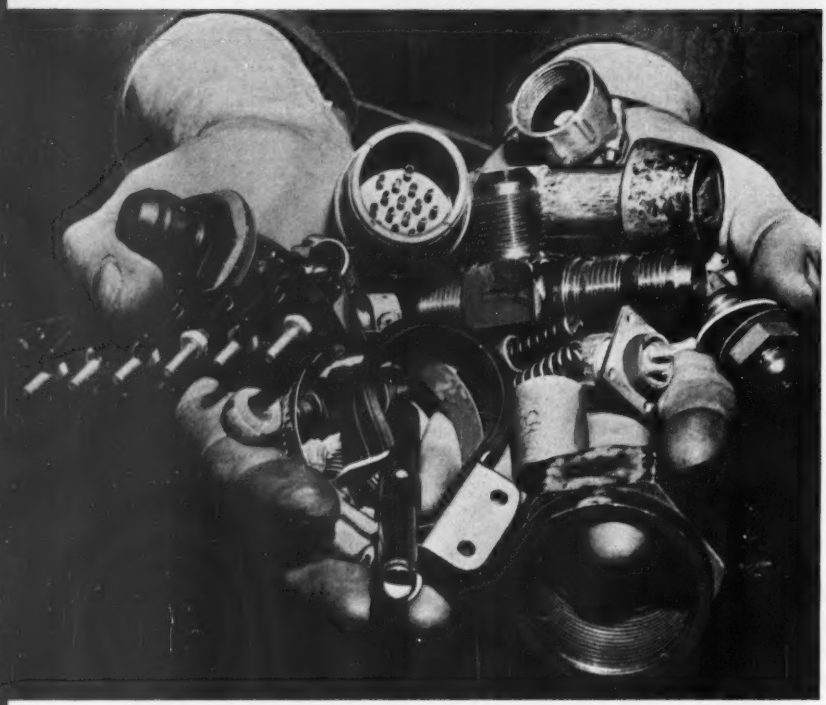
In a sense, the conservation committee is the cop on the corner, charged with stopping waste. Some waste, of course, is inevitable. When waste does occur, it becomes the responsibility of the reclamation and stores department. Through this department's junk yard flows every bit of scrap material. There it is sorted, sheared, baled, or briquetted. Part is reclaimed for Boeing use, the rest sold to smelters, paper manufacturers, and other concerns engaged in reprocessing.

Floor sweepings from the plant are run through a vacuum machine that separates the paper and dirt from the pieces of metal. The metal pieces go to a sorting belt, where sheet fasteners, hose clamps, and other items are segregated for return to production lines. In the past, such standard items as nuts, bolts, washers, and fittings were issued to mechanics on request. Last year, Boeing plant stores switched to a practice of issuing standard parts kits for each individual job. If two bolts are required, the kit contains



Efficiency is best cost-cutting weapon. Router work is laid out to get as many parts as possible from each sheet.

Boeing Efficiency Starts



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port. This report constitutes a monthly evaluation of all work that has been rejected for faulty workmanship or other causes, and it is watched closely by superintendents and even by the vice-president in charge of manufacturing.

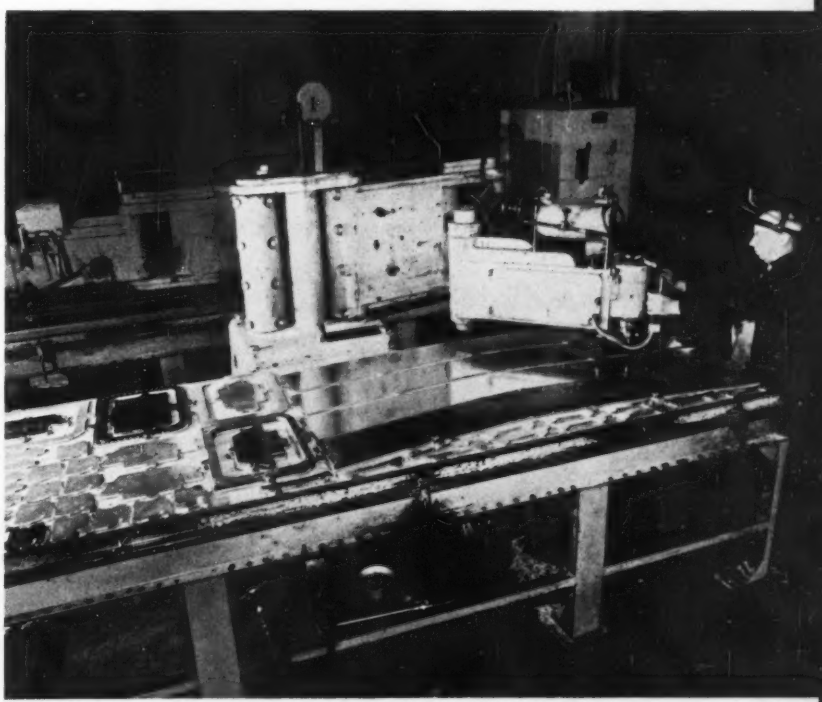
Another big factor in reducing waste has been the Seattle Division's material conservation committee. For the most part, this committee has pointed its finger at many specific items of waste through the pages of the *Boeing News*, the company's employe newspaper. A film—"Let's Stop Waste"—has done an excellent job of making employes aware of the large losses carelessness can cause. The picture illustrates how failing to clean a paint brush ruins it, how using too much mask tape or dropping rivets is wasteful, etc. Graphic representation of the cost of tool breakage in one department is shown by a panel on which are mounted the broken tools turned in during one week.



Aluminum chips are briquetted and sold. More than 3,000,000 pounds of aluminum were salvaged in 1951.

In a sense, the conservation committee is the cop on the corner, charged with stopping waste. Some waste, of course, is inevitable. When waste does occur, it becomes the responsibility of the reclamation and stores department. Through this department's junk yard flows every bit of scrap material. There it is sorted, sheared, baled, or briquetted. Part is reclaimed for Boeing use, the rest sold to smelters, paper manufacturers, and other concerns engaged in reprocessing.

Floor sweepings from the plant are run through a vacuum machine that separates the paper and dirt from the pieces of metal. The metal pieces go to a sorting belt, where sheet fasteners, hose clamps, and other items are segregated for return to production lines. In the past, such standard items as nuts, bolts, washers, and fittings were issued to mechanics on request. Last year, Boeing plant stores switched to a practice of issuing standard parts kits for each individual job. If two bolts are required, the kit contains



Efficiency is best cost-cutting weapon. Router work is laid out to get as many parts as possible from each sheet.



Methods men make time and motion study of C-97 installation work at Boeing's Renton plant.



Operating plan evolved from time and motion studies consists of a sequence-of-operations chart and an operation and inspection record, shown being checked by mechanic.

two bolts, no more. There is not much room for wastage.

In addition to scrap, the reclamation and stores department does a rousing business in sales of surplus equipment no longer needed. A mail-order advertising program has enabled more than a million dollars to be realized in the past four years in resales.

Methods studies by one section of industrial engineering consist of re-examining production methods and preplanning them. When a manufacturing plan has been agreed upon, flow charts are issued showing the assembly sequence. Once production is under way, the methods studies section is available for study of any particular part of the operation. Called in by factory supervision, the methods people start their analysis by time studies. These are just what the name implies—the clocking of each individual task performed in the shop.

Another typical example of dollar-pinching cooperation between industrial engineering and the shops is a double-barreled program involving fabrication work. The first phase of this program calls for getting as many parts as possible out of a sheet of aluminum-alloy stock, and getting them the first time it goes to the shop. Before going to the machine for routing and shearing, the sheet is marked for as many different combinations of pieces as can be cut from it, "nesting" them together so they resemble the pieces of a jigsaw puzzle.

Phase two of the program grew from the fact that setting up a fabrication machine was a time-consuming process. Formerly, a saw, shear, router, brake, or punch press was set up for a single part, then usually had to be reset because the next job had different requirements. Now similar jobs are grouped so that a number of them can be performed with practically no change in set-up. For example, parts to be sawed with identical miter cuts are scheduled consecutively.

Neither Boeing nor the Air Force can evaluate the dollars saved thus far; there are too many intangibles involved. Even the savings may, at this point, look intangible to the burdened man who pays the taxes. But, whether built by Boeing or by someone else, there is nothing intangible about extra airplanes that money will buy.

INGENIOUS *Mechanisms*

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanism for Checking the Torque of Tappet Screws

By HERBERT CHASE

Tappet screws applied to the rocker arms of the new Studebaker V-eight engines must make a proper fit in the tapped thread for the assembly to pass inspection. If the fit is too loose (30 inch-pounds is the minimum torque specified), the screws may become more slack during operation; and if too tight (120 inch-pounds is the maximum allowed), adjustment for making service repairs is difficult.

As there are sixteen rocker arms per engine and each must receive a screw that is applied within the torque specified, a special means of applying the screws and checking the torque automatically and rapidly was devised. Each of three Bodine tapping machines—equipped with a socket wrench instead of a tap—is used to drive the screws after starting them by hand.

To check the torque applied, each machine is equipped with a special mechanism so designed that if the torque needed at any point in driving the screw to a specified depth is outside the limits set, the assembly is rejected. Assemblies coming within the limits are automatically dropped into a tote box below the machine.

A close-up view of one of these machines is seen in Fig. 1, while Fig. 2 is a detailed drawing of the torque-control mechanism. To check the torque applied to the screw *A*, seen in Fig. 2, rocker arm *B* is mounted on a plunger *C* which passes through its central hole. The cylinder *D* holding this plunger is mounted on a turntable *E* which is supported on balls. The turntable is thus free to rock horizontally through a certain angle without significant friction when torque is applied to the screw. The screw is located directly under the socket wrench held in the vertical spindle of the machine.

Before loading the rocker arm over the plunger, the operator starts the screw by hand (as seen in Fig. 1). As the rocker is mounted on the plunger, it pushes pin *F* inward to actuate limit switch *O* and automatically start the machine. The wrench then grips the screw and feeds it downward into the arm, applying whatever torque is required.

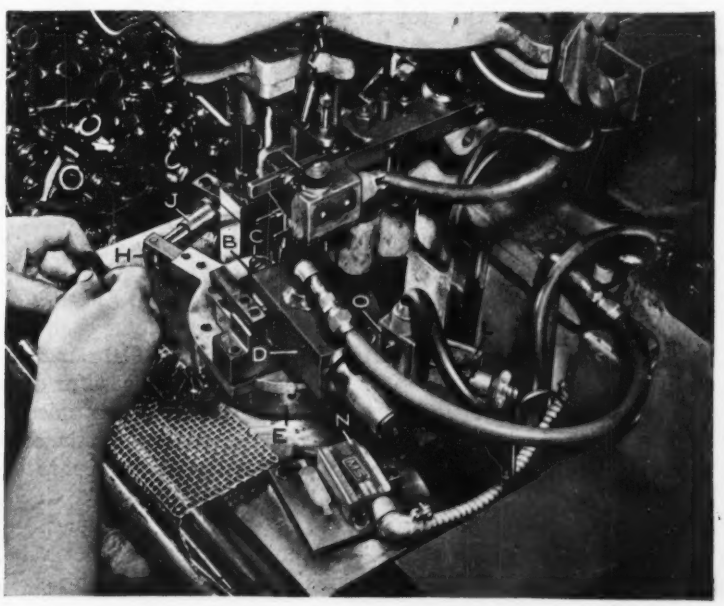


Fig. 1. Set-up for assembling screws in tapped holes of rocker arms for Studebaker V-eight engines, using a tapping machine equipped with a socket wrench to turn the screws

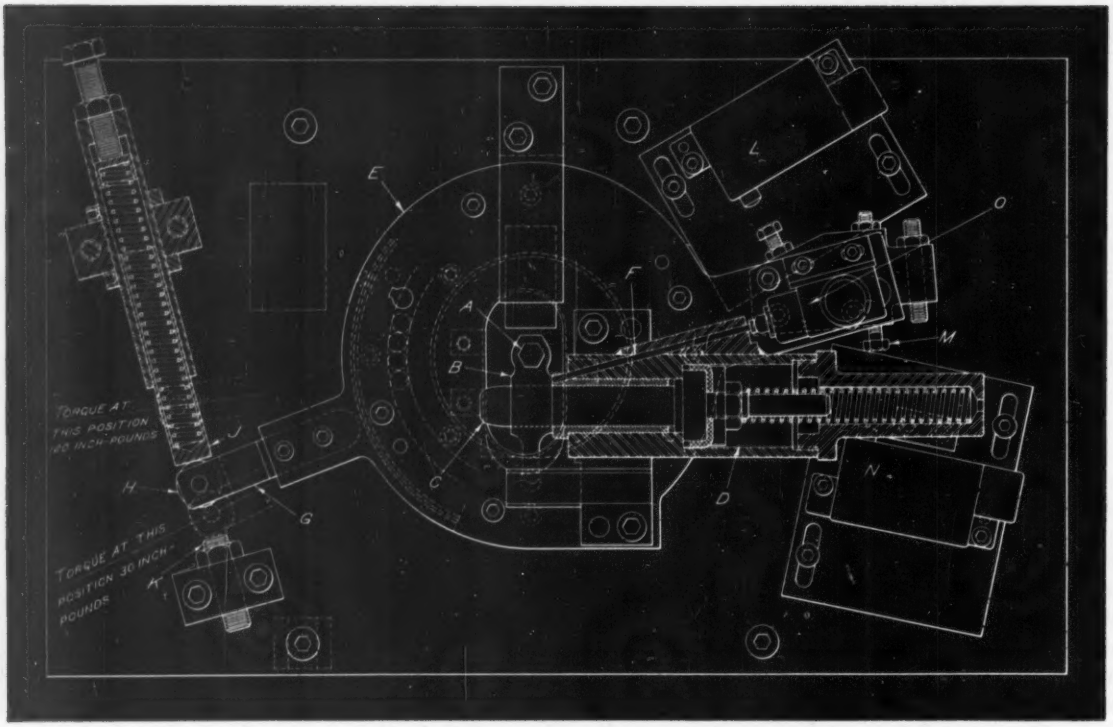


Fig. 2. Assembly drawing of the torque inspection mechanism. The rocker arm (B) is applied over plunger (C) in a cylinder mounted on turntable (E). Torque is measured, in effect, by the resistance of a spring in back of piston (J).

Projecting radially from the turntable is an arm *G* that carries a roller *H* in contact with a piston *J*, which is pressed outward by a spring. This spring presses the roller against a fixed stop-screw *K* with sufficient pressure to resist a torque of 30 inch-pounds. If the torque applied to the screw does not exceed this amount, the roller will not leave the stop and the plunger *C* will not retract at the end of the cycle because switch *L* remains open. In this event, the operator knows that the screw is too loose a fit. Consequently, he must remove the rocker arm from the plunger by hand and place it in a box which holds rejected assemblies.

If the torque exceeds 30 inch-pounds, roller *H* will be swung clockwise against steadily increasing pressure of the spring behind piston *J*. If the torque reaches 120 inch-pounds, the roller will reach the position indicated in Fig. 2. When this occurs, a stop-screw *M* on the opposite side of the turntable contacts switch *N*, and by tripping this switch prevents plunger *C* from retracting at the end of the cycle. This occurrence warns the operator that the torque is above the limit set. He consequently removes the assembly by hand and puts it in a reject box.

In case the torque applied is not outside the specified limits, the tapping machine spindle feeds down a specified amount in driving the screw and then automatically retracts. As the spindle reaches its upper limit, it trips a switch that operates a solenoid. This, in turn, opens an air valve, admitting air to the cylinder whose piston retracts plunger *C*. This retraction will not occur, however, if roller *H* has not left the stop-screw *K*, or if the roller has moved far enough to trip the switch *N*.

When the applied torque is within the limits set, retraction of the plunger *C* releases the assembly and it drops through a hole in the base of the machine and into a box containing acceptable parts. A spring then returns the plunger, ready to repeat the cycle. With this set-up, it is possible to apply screws to 362 rocker arms per hour on each machine.

All the operator does is to start each screw and then load the rocker arm on the plunger. The remainder of the cycle is automatic and the operator does not even have to remove the workpiece unless it is unacceptable.

As the cylinder carrying plunger *C* is mounted on a turntable that must move freely, the air lines to the cylinders are made from flexible rubber tubes. The resistance of these tubes to bending as the turntable rocks has a negligible effect on the torque applied.

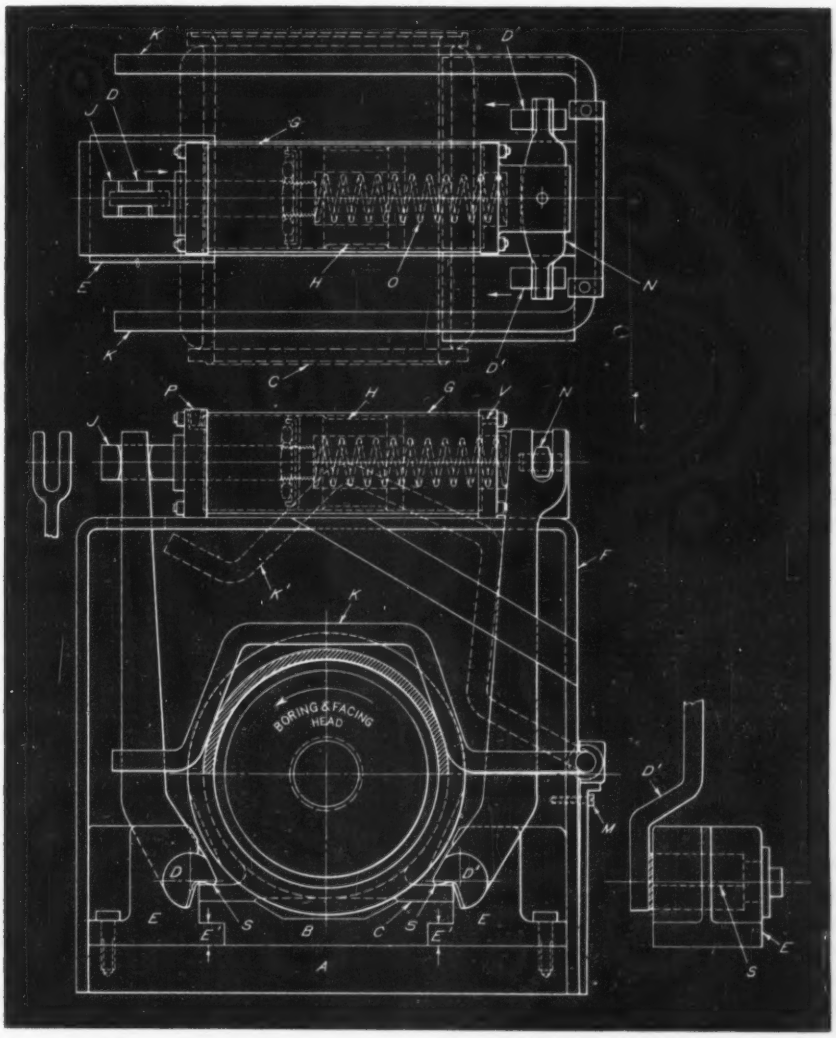
Air-Operated Clamping Mechanism for Cylinder Boring Fixture

By ROBERT S. NEWTON

The cylinder boring fixture shown in the accompanying illustration is equipped with an ingenious air-operated clamping mechanism designed to hold the work securely without distortion. The work (cylinder *C*) is located on saddle *B* which is a close fit over the tongues *E'* on brackets *E*. Cylinder *C* is located or centered by means of the pivoting bracket *K*, which is shown in the open position by dotted lines *K'*.

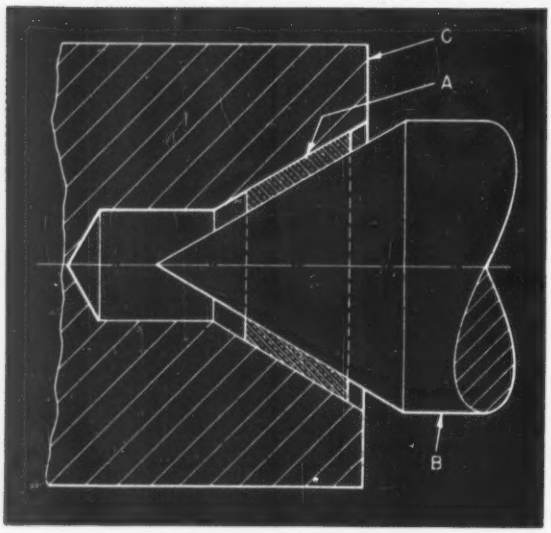
Air cylinder *G* which actuates the clamping mechanism is slidably mounted on bracket *F*, so that when air is admitted to the cylinder, the piston rod *J* will move to the left while the cylinder *G* will move to the right. The open or non-pressure head end of the air cylinder is connected to the equalizer bar *N* which actuates the clamping levers *D'*. The outer end of piston rod *J* fitted to piston *H* is connected to lever *D*.

Air admitted to cylinder *G* at connection *P* acts on piston *H*, compressing the release spring *O* and moving levers *D'* and lever *D* to the clamping positions shown. In these positions the levers exert the required clamping pressure on the work at points *S*. A long bearing surface at *S* (as shown in the separate view in the lower right-hand corner of the illustration) serves to distribute the load over a larger area. The vent *V* in the non-pressure end of cylinder *G* permits only atmospheric pressure to act on the right-hand side of piston *H*. When air is exhausted from the closed end of the cylinder, spring *O* causes the upper ends of levers *D'* to move to the right and the upper end of lever *D* to move to the left so that the clamping pressure is released at points *S*. Screw *M* is adjusted to obtain sufficient friction clamping pressure on bracket *K* to hold it in the loading position *K'*.



Cylinder boring fixture equipped with air-operated equalizing clamping levers

Ideas for Shop and Drafting-Room



A tapered bronze bushing (A) placed on lathe center (B) protects the center during rough-machining.

Bushing Protects Lathe Centers During Rough-Machining

By JOSE SOBKOWIAK, Jackson, Mich.

Tapered bronze bushings such as the one seen at *A* in the accompanying drawing can be placed between the lathe centers *B* and work-piece *C* to protect the centers during rough-machining. In this way, the work can be rough-machined and then finished on the same lathe without the need for changing or repairing the centers. For improved accuracy in finish-machining, the bronze bushings are usually removed and the work rests on the lathe centers.

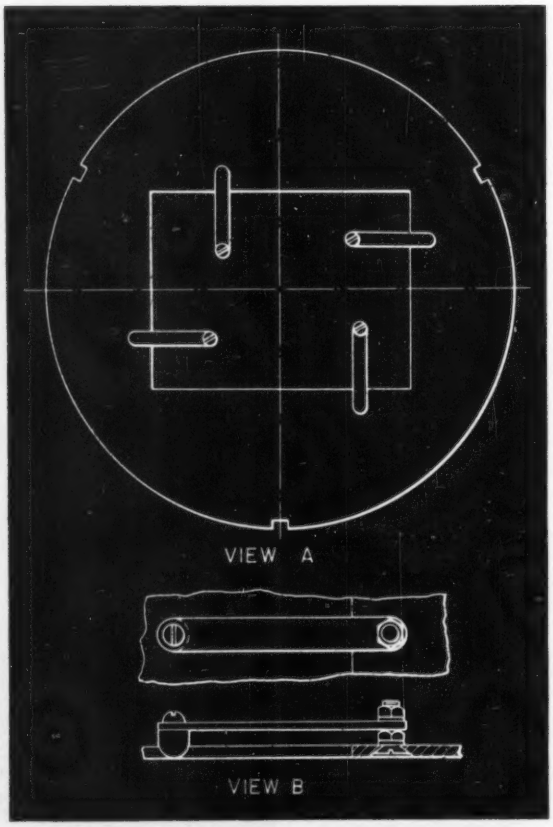
Masking Device for Projection Type Comparators

By K. H. STEENBURGH, Schenectady, N. Y.

Where a small template is to be used on a large projection type comparator, the unused area of the screen can be covered with a Bakelite mask. Eliminating the excess light in this manner reduces the strain on the operator's eyes and focuses his attention on the working area. Furthermore, masking out the screen gives a sharper picture. The mask also makes it possible to use a smaller piece of Lucite than would ordinarily be required for clamping a small template on a large screen.

View *A* of the accompanying illustration is a drawing for a typical mask. This particular mask is for a template measuring 8 by 6 inches which is to be used on a 14-inch comparator. The 1/8-inch thick Bakelite material is cut out as indicated. Near the central rectangular opening are four bronze springs by which the template is secured. One of the springs is shown enlarged in view *B*. The springs pivot around screws countersunk in the mask and have rubber pads beneath their free ends.

Instead of having piles of odd-shaped templates cluttering up the shop, the practice of using masks permits the templates to be made to some standard size and filed for easy access. Usually, having a few masks on hand with different size openings, such as 6 by 4 inches, 7 by 5 inches, and 8 by 6 inches, should prove sufficient for all of the small templates required by the average shop.



This inexpensive mask reduces strain on the operator's eyes when a small template is to be used on a projection type comparator.

TOOL ENGINEERING *Ideas*

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

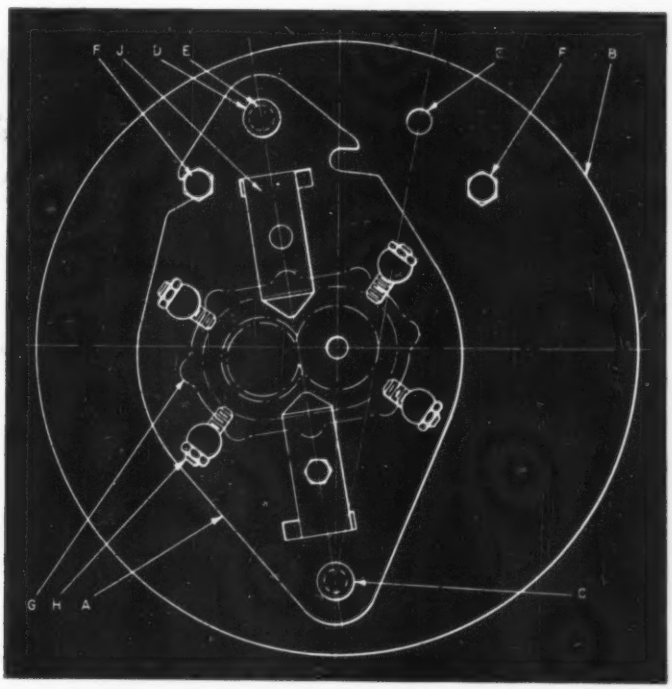
Two-Position Faceplate Fixture that Maintains Center Distance in Boring

By ANDREW E. RYLANDER, Walnut Creek, Calif.

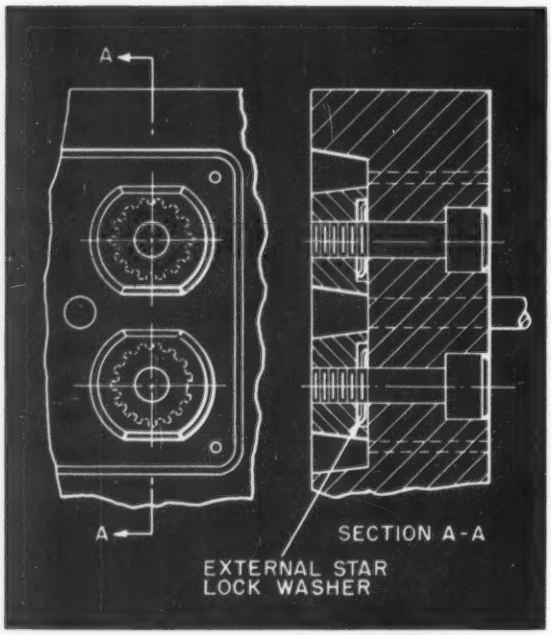
Twin holes in gear housing castings were rough- and finish-bored on a turret lathe to an accurate center distance by means of the "rocker" type faceplate fixture shown in the accompanying illustration. The diamond-shaped fixture *A* is pinned to the faceplate *B* at *C*, around which it can swivel from the illustrated position, where the diamond lies to the left side of the plate, to an alternate position, where the diamond lies to the right side of the plate. A locating plug *D* in the fixture enters one of two bushings *E* in the faceplate, after which a lock-screw *F* can be tightened to bind the fixture to the plate.

Casting *G* is located in the center of the fixture, where it can be adjusted by set-screws *H* to bring one of the cores onto the center line of the faceplate. After the work has been secured to the faceplate by straps *J*, the first hole can be bored. To bore the second hole, the engaged lock-screw is loosened, the locating plug is removed, and the fixture is swiveled to its alternate position, where the locating plug can enter the other bushing, after which the second lock-screw can be tightened.

The length of the arc between the bushings of the faceplate is accurately established, inasmuch as this will determine the precision of the center distance of the holes. If in a similar application the operation is to be performed at high speed, it would be advisable to fix a counterweight to the faceplate at an appropriate point, in order to compensate for the off-center lay of the diamond-shaped fixture.



Holes can be successively bored to an accurate center distance without resetting the work in this "rocker" type fixture.



The alignment of the inserts in this die cavity is maintained by external star lock washers.

Preventing Inserts from Turning in Cavities of Die-Casting Die

By R. M. WEBER, San Francisco, Calif.

Some ordinary lock washers recently solved a problem encountered by a West Coast die-casting concern. In a large low-pressure die, purchased from an outside source, inserts in cavities constantly worked loose on their retaining screws and turned during the casting operation. Since there were forty inserts (four in each of ten cavities) in the die, production was impeded by frequent interruptions in order to align and tighten the inserts. Moreover, parts inspection became a factor, and the number of rejections was considerable.

The trouble was ended by increasing the friction between the inserts and the cavities with commercially available external star lock washers, as can be seen in the sectional view of the accompanying illustration. To accommodate the washers, a counterbore was ground into the back of each insert. The depth of the counterbore was made just a few thousandths of an inch greater than the nominal thickness of the washer, so that in tightening the insert the teeth of the washer were pressed against the insert and cavity.

Comparator Gage for Internal Measurements

By L. S. SANTER, Melbourne, Australia

During investigations on creep in timber at split ring and shear plate connector joints, it became necessary to devise an instrument for recording a large number of measurements in the shortest time possible, without any great sacrifice in accuracy. The measurements were

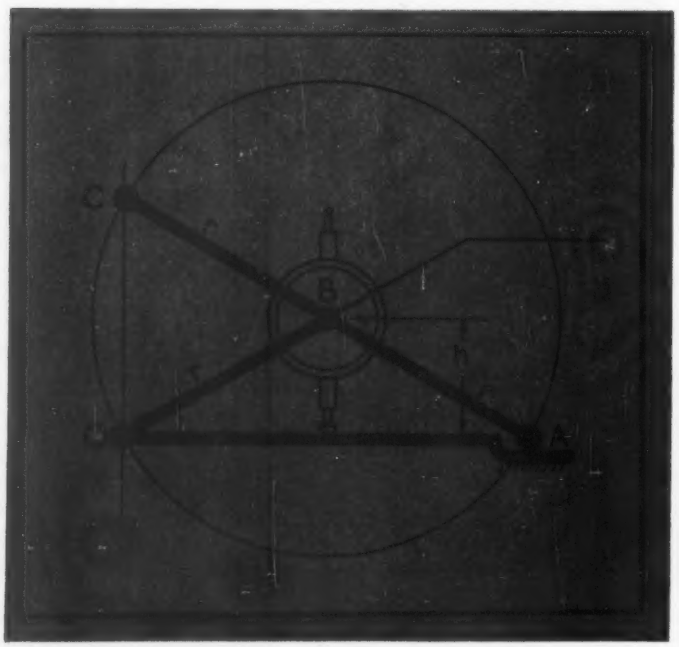


Fig. 1. Comparator gage for internal measurement is based on the Scott-Russell straight-line motion

ordinarily taken with an internal screw micrometer. The limited range of this micrometer and the personal error in setting and reading this type of instrument made it impractical for recording as many as 640 measurements in a matter of two hours. The instrument here described was devised to eliminate the personal error in setting and to record a much greater number of readings in a limited time. It also permitted the use of a dial gage, which is much easier to read and requires less skilled operators.

The gage is of the comparator type, and is based on the Scott-Russel straight-line motion. As seen in Fig. 1, *C* will move on a straight line, provided *A* moves on a plane surface. There are two links *OB* and *AC*. *OB* is one-half the length of *AC* and is pivoted at *B*, which is at the mid-point of *AC*. *OB* is also pivoted at *O*. Since $AB = BC = BO$, a circle around *B* as center will intersect *A*, *O*, and *C* at any position of the link. Consequently, the line *CO* is perpendicular to *OA*, *AOC* being an angle in a semicircle.

The instrument is made of aluminum castings and, as shown in Figs. 2 and 3, has measuring points at *O* and *C*. A baseplate *a*, connecting *O* and *A*, contains a slot *b*, which provides the plane surface at *A*. As may be seen in Fig. 1, the travel of *B* is always half of that of *C*. An Ames dial gage No. 282, calibrated in increments of 0.001 inch, with 1 inch of travel, is suspended on a fulcrum pin and registers the movement between *B* and bracket *c* on the baseplate.

In order to keep the dial gage normal to the baseplate, the extension of the fulcrum pin is guided in a slot *d* which also contains a pin *e*, Fig. 3, to protect the dial gage from shock load. The springs *f* keep the instrument in the open position and facilitate its use. The initial setting of the gage by means of a standard gage piece is illustrated in Fig. 4. When the dial is adjusted to zero, the instrument is ready to be used as a comparator and direct readings can be made to 0.002 inch if the

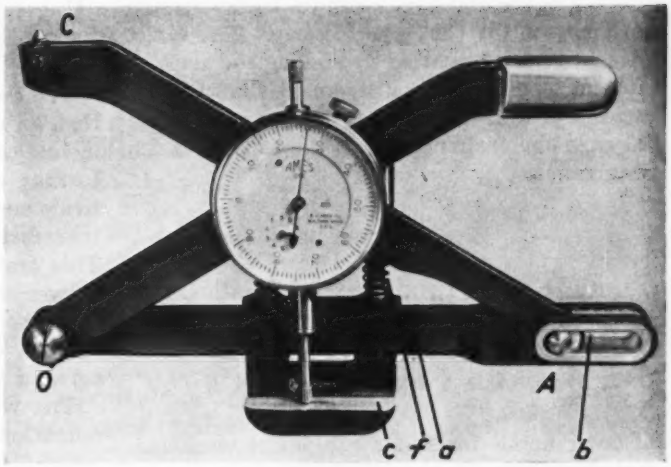


Fig. 2. Front of gage showing slot (b) which provides a plane surface for sliding member (A) and the measuring points (O) and (C)

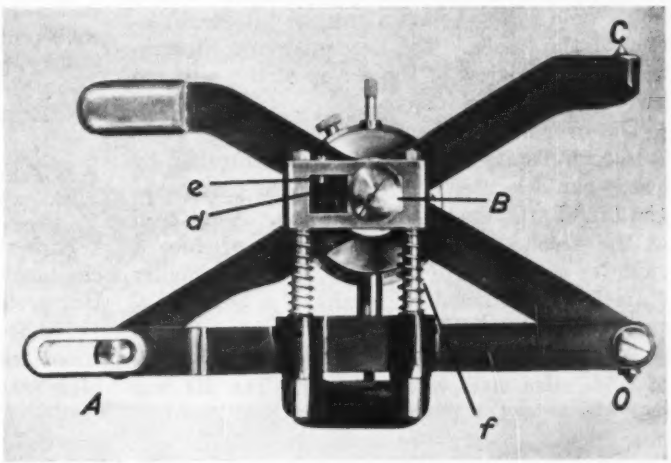


Fig. 3. Back of comparator gage showing slot (d) in which extension of fulcrum pin is guided. Springs (f) keep instrument open.

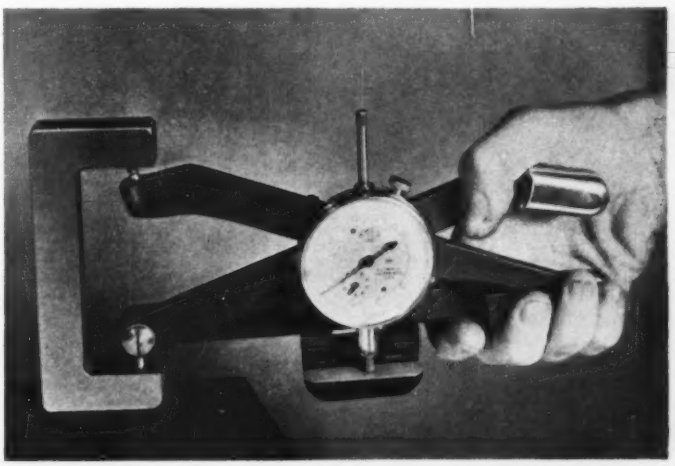


Fig. 4. Setting comparator gage by means of a standard gage piece. When dial is set at zero, readings can be made to 0.002 inch.

accuracy of the dial gage complies with standard specifications for this type of gage. The range of the gage can be varied by making the arms of different lengths. The instrument shown has a range of 2 to 3 1/2 inches. The travel of the dial gage obviously needs to be half of the measuring range.

Plastic Knobs Produced in Small Lots on Hand Screw Machine

By DONALD A. BAKER, Boonton, N. J.

Plastic knobs for radar equipment were successfully produced on a hand screw machine when the limited quantity required made the cost of molding prohibitive. The complicating factor was that a series of shallow flutes to give finger hold had to be cut along the outside diameter of the knobs. The accompanying illustration is a plan view of the set-up of the hexagon turret of the machine.

The over-all length of the knobs, made from 7/16-inch Tenite No. 2 stock, was controlled by a stop-bar *A* located at the first of the four hexagon turret stations used for the job. A cutter *B* at the second station was used to produce a chamfer at the end of the knob, then the smaller diameter was turned by means of a box tool *C* supported in the third station.

To form the grooves, a simple cutting die *D* of cold-rolled steel was designed. The die was supported in the fourth station, and for this operation the motion of the machine spindle was, of course, arrested while the turret ram was advanced and retracted. After the knob was cut off, a shaft hole was drilled in the flange end in a secondary operation.

Transfer Mechanism that Speeds Up Automatic Turning

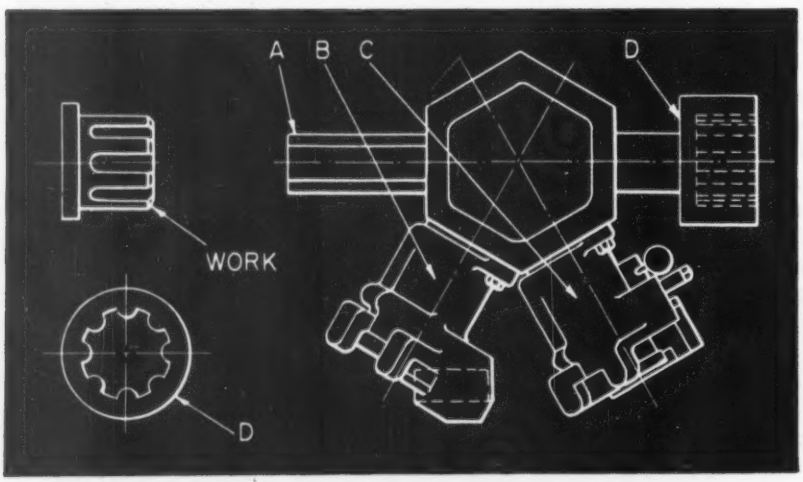
The Seneca Falls Machine Co. has announced that an order has been received from an automobile company for two batteries of automatic turning equipment that are serviced by an entirely new method of automatically handling and transferring work from machine to machine. This transfer mechanism makes it possible to deliver at one end of the line rough stock which is to be machined, and carry it through the various operations of milling, centering, and turning without manual labor.

The work is automatically gaged after each operation, and if any dimension is not within prescribed tolerances, lights indicate which dimension is "off." An electronically controlled system prevents further machining of inaccurate work. This development is particularly suited to the handling of automobile axle shafts, stem pinions, electric motor shafts, gun barrels, shells, and similar work.

* * *

A.S.T.E. and Toledo University Sponsor Tool Engineering Course

A four-year evening session course in tool engineering is being offered by the Toledo University, Toledo, Ohio, beginning September 11, in cooperation with Toledo Chapter 9 of the American Society of Tool Engineers. Open to high school graduates, the program leads to a certificate of Associate in Industrial Science, credit for which may be partially applied toward a degree in engineering. This curriculum is being initiated in other colleges also through the efforts of the A.S.T.E. to ease the national shortage of trained production engineers.



Plan view of an unusual turret lathe set-up for machining a plastic part

Three-Dimensional Models Slash Plant Lay-Out Time

By PHILIP BRENTON, Jackson, Mich.

STREAMLINED planning procedures making use of scale model lay-outs have enabled the Kaiser-Frazer Corporation to convert 1,300,000 square feet of its Willow Run, Mich., plant from automobile to aircraft production in record time. The scores of blueprints necessary for controlling the positioning of machinery and other equipment were made directly from the model instead of by the conventional, time-consuming method of drawing tracings. As a result, thousands of man-hours and months of drawing-board time were saved, and the first Fairchild C-119 twin-engine transport was run off the production line months ahead of schedule.

Awarded a half billion-dollar contract in September, 1950, the corporation had begun to operate on the defense project by the following January. About one-third of its huge plant (3,500,000 square feet) was cleared of automobile production, and an "iron curtain" was erected to divide the automobile and aircraft operations. Planning of the lay-out began on January 10 and fabrication of the first plane started on June 26. Automobile production was not interrupted during the change-over, and it still continues on its own side of the "curtain."

Before this enormous project could be started, engineers had to solve the problem of installing thousands of machines and other pieces of equipment in the 80 acres of floor space that had been cleared. Three-dimensional models for plant lay-out had been used during World War II with excellent results, and it seemed likely that something similar could be used to good advantage at this time.

Even though it was scaled at 1/4 inch to the foot, the "miniature" lay-out required a space 35 feet wide and 70 feet long. Fig. 1 shows a partial view of the lay-out. Because this was still too big to handle, the engineers broke it down into 6- by 6-foot tables having rubber casters, so that the planning could be done in



Fig. 1. Partial view of the 35- by 70-foot scale lay-out of Kaiser-Frazer's huge Willow Run aircraft production plant. Viewing the planes, which are in progressive stages of assembly, are (left to right) Harvey Smith, aircraft works manager; John Hallett, vice-president and general manager; John Tackle, operations manager; and Edgar Kaiser, president of the Corporation.



Fig. 2. Using the original system, the models were cemented to pieces of glass. By inverting the glass over special open-top tables the engineers then positioned templates in place on grid sheets.

comparatively small sections. Each table was further divided into six 2- by 3-foot sections on which were located diazo sheets ruled in 1/4-inch squares covered by 2- by 3-foot sheets of glass.

The next step was to acquire exact scale models of every piece of machinery and equipment to be installed. The simple items, like benches, were made on the premises, but the machine models and those of the planes and plane parts were purchased from the Visual Planning Equipment Co., Oakmont, Pa. In all, about 8000 figures were required.

Working with the scaled models and grid sheets, the engineers laid out the entire plant, positioning every machine and bench in its proper place. Since all the models were made to exact scale, it was possible to reduce the need for later changes occasioned by a lack of clearance, inadequate illumination, or other reasons. In many cases, models of workers were placed in their proper position. Plant engineers estimated that a person would have to be 568 feet tall in order to get the same view of the plant that he gets by looking at the model.

The model lay-out was a tremendous help in arranging the equipment for the plane-building project, but it was not nearly as important as the procedures developed for getting these locations down on paper. It was estimated that if the blueprints had been made on the drawing-board in the conventional manner, it would have taken 160 men six months to accomplish the job. As it was, the job was handled by 60 men in just two months—not only saving drafting time, but also obviating the need to recruit hard-to-find personnel.

A method of transferring the locations of the equipment from the tables to paper was devised. Later, this method was improved upon. Originally, the models had been located and then glued in place on the glass so that they maintained their position when the glass was inverted over a special open-top table, as shown



Fig. 3. Now the table models are not disturbed. Instead the engineer places the templates in positions corresponding to those of the machinery on the table model. Here an engineer is comparing a grid sheet, left, with a finished print.

in Fig. 2. In the next step, pieces of transparent grid sheet, cross-lined into 1/4-inch squares, were placed on the glass, and templates corresponding in shape to the bottom of the models were positioned on the grid sheet at the proper points. Other information was penciled in.

When all the information in the model lay-out was duplicated on the grid sheet, it was a simple matter to obtain diazo prints by running the sheet through an Ozalid machine. Since the templates were made of a special adhesive, they could be peeled off and moved at will.

This procedure was fairly satisfactory save for the fact that sometimes the models would fall off when the glass table top was inverted. And even if nothing came loose it was always cumbersome to lift and handle the large pieces of glass. Now, however, the glass tops are never moved from the table. In making a record of the lay-out, an engineer merely works with one of the grid sheets and positions the templates by counting the squares in the model. If a machine is moved 1 foot, for example, he peels its template from the grid sheet and resticks it one 1/4-inch square over in the proper direction. A print can be turned out in a matter of minutes. In Fig. 3 is shown an engineer comparing a sheet with a finished print.

The advantages of the model lay-out system have been many. For one thing, it gives the millwright gangs a picture they can work with even though they may not know how to read blueprints. Almost anybody can grasp the idea that each of the 1/4-inch squares equals 1 square foot of floor space, and the actual machines can then be positioned with a yardstick.

It was also a help to the planners because it gave them a certain and simple means of visualizing the huge plant while it was still empty. They have found too, now that the plant is operating, that it is easier to study a department on a table than it is to visit the department itself. Moving heavy machinery about is a very expensive and time-consuming way of finding the best arrangement. Moving just one machine can cost thousands of dollars and upset an entire production line. The table model eliminates all this.

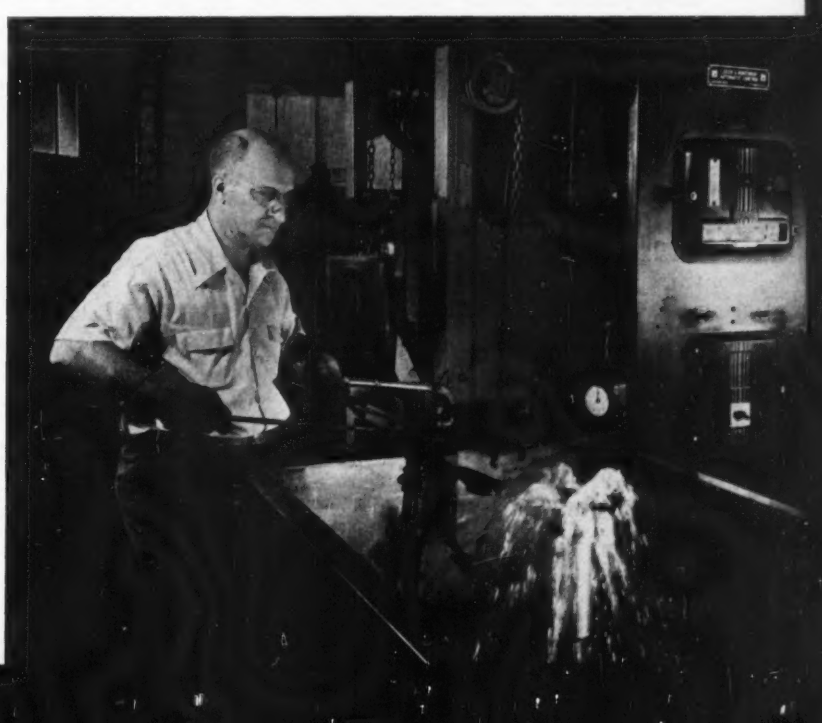
Kaiser-Frazer has learned, too, that its system is much simpler and more accurate than the conventional way of making drawings. Actually, better prints are obtained faster. All in all, the system proved capable of conserving both time and manpower. But more than anything else, it enabled the corporation to put the first Fairchild cargo plane into the air just about a year sooner than was thought possible.

* * *

Crucible Steel Company of America Expands Testing Facilities

Enlarged and expanded testing and development facilities have recently been completed at the Park Works of the Crucible Steel Company of America, Pittsburgh, Pa. The additional facilities will permit steel to be tested at the mill under the same conditions as those experienced in actual service.

Besides the latest mechanical testing machines, Park Works has enlarged its simulated service testing for mining and quarrying steels, special steels for power and hand saws, and steels for many other applications. To test saw-blade steels, all types of tension measuring devices, power input meters, and controlled power sawing machinery have been installed. The new facilities are available to the trade for cooperative studies on specialty problems.



This quenching test at Crucible Steel's Park Works checks hardening qualities of special steel alloys. The apparatus is part of the extensive simulated testing facilities used before steel shipments are made.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

There is Magic in Perspective

NEITHER machine tools nor industry today is like a Maine lobster. "Hasn't changed a bit," a hoary fisherman said to me as he held out a wriggling specimen. "Tastes exactly the same as fifty years ago."

Happily, many of our sales engineers today are young men, but they are able to recall only what has happened in recent years. By a broader scope of vision expanding further into the past, they cannot only strengthen and focus their selling reasons, but also can gain a new conception and enthusiasm for the magic of industrial accomplishment in the metal-working field. Startling economic changes and achievements can serve as the basis for more comprehensive sales arguments.

Let's pick out a few cold but significant statistics that should attract the prospect's interest and center his attention. As children, we may have read the fantastic and prophetic stories by Jules Verne on what was to come in the world of science. Yet brief statistics of industrial developments reveal accomplishments almost their equal.

Many automatic devices on tools today were unknown twenty-five years ago. Hydraulic controls, for instance, now operate feed slides, clutches, spindles, and clamps. Electronic systems, through push-buttons, activate and control speeds, feeds, and movements of heads, spindles, brakes, and saddles. In the past, who would ever have dreamed of facing large diameter work with a constant cutting speed automatically maintained as the tool progresses toward the center?

Consider lubrication, not from containers, but from tubes through which the lubricant is carried. Some of us recall how the oil-can was as necessary as the machine tool itself, but today no angry foreman exclaims "You didn't lubricate it right."

Just think of measurements and the present use of light waves to check extreme accuracy. The steel tape and rule are now often on the back shelf with the oil-can. In 1920, measurement of a thousandth of an inch was an accomplishment to crow about. But common tolerances today are plus or minus three ten-thousandths inch. We talk now of the micro-inch, as in lapping. Try to visualize one millionth inch by comparing it to an eyelash!

Then there is the magic of cemented carbide for cutting. Back around 1928, 40 feet a minute was a good cutting speed for cast iron. It was up-to-date practice. But today with tungsten carbide tools, this figure is 210 feet a minute.

Materials are being bred from a marriage of the engineer's mind with the research laboratory. Magnesium, $5 per pound in 1915, is now in common use and has fallen to a twentieth of the old price. From wheelbarrows to airplanes, lighter weight materials are employed. Titanium—lighter and stronger than steel—with its ability to meet high temperatures, has opened the way for the jet engine. "Super machining" steel, stainless steel, and hundreds of alloys might bewilder the oldtime mechanic.

All these relate to material accomplishments. But now let's hold on to the arms of our chair for the shock of those vital changes affecting man-hours and the dollar.

Price of finished steel per pound in 1932 was 1.9 cents, and in 1951, 4.1 cents.

Price of pig iron per ton in 1932 was $14, and in 1951, $52.07.

Wage rate of skilled mechanics per hour in 1914 was 27 cents; in 1922, 50 cents; and in 1951, $1.82.

There is a point to citing these glaring changes and accomplishments. Being better informed, we can do a more effective sales job.

Summarizing, we can get more orders if we

know operational possibilities better—understand materials and their characteristics—grasp the importance and value of man-hours—point out that change never stops dead in its tracks—and dramatize improvements and their results.

The story is told of four men who took a journey to Africa to shoot elephants—an Englishman, German, Frenchman, and American. When each returned he wrote a book on his exploits. The titles of the four books were, respectively: "The Sport of Shooting Elephants"; "The Species of the Elephant"; "The Amours of the Elephant"; and "Bigger and Better Elephants."

The history of our whole approach to machine tools has been "bigger and better." Bigger, particularly in the realm of what they will do, and better in the way they do it. Are we selling the magic of accomplishment to our prospects, and thereby getting "bigger and better" sales?

* * *

"Blind Lockbolts" Save Hundreds of Hours on Emergency Aircraft Repairs

Enormous savings in time were made recently in repairing aircraft at one of the United States Air Force's largest air bases through the use of Huck "Blind Lockbolts," made by the Huck Mfg. Co., Detroit, Mich. These lock-bolts are installed by one person working from only one side of the assembly. A record of ten actual emergency repair jobs showed a saving of 659 man-hours over conventional methods.

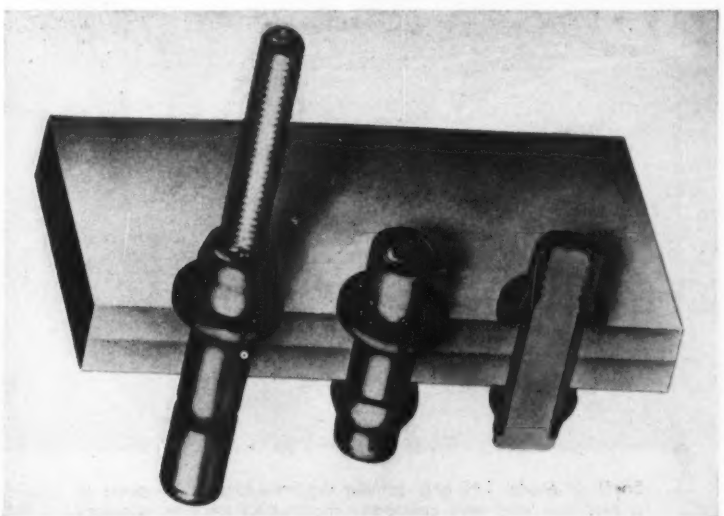
One of the greatest savings made possible by this new fastening method was in the replacing of loose rivets in integral fuel tanks and in attaching stress plates to fuel tank web spars. Before repairs can be made on fuel tanks of this kind by conventional methods, it is necessary to drain, clean out, flush, ventilate, and install protective mats on the bottom of the tanks. This requires from 44 to 120 hours per plane in addition to the actual repair work, whereas by employing "Blind Lockbolts"—such as shown in the accompanying illustration—it is possible for the repair work to be done by one person working outside the tank. By eliminating the additional work, the repair time was reduced from 120 to 2 man-hours on these two jobs.

In another case, attaching an angle brace to the main longeron spar face, which formerly required 200 man-hours, was completed in only twenty minutes through the use of "Blind Lockbolts."

* * *

S.S. United States Required 1,500,000 Rivets

The *S.S. United States*, the largest commercial vessel ever built in this country, is one of the fastest and safest ships afloat. An interesting feature of the 990-foot, 52,000-ton superliner's construction was the use of more than 1,500,000 aluminum rivets. The high-strength, lightweight fasteners were first heat-treated and placed in cold-storage to retard age-hardening. Then the rivets were removed and driven immediately. A two-man crew usually drove from 1200 to 1500 of them during an eight-hour working day. Shipyard workers soon learned that by allowing the rivets to age-harden for a few hours, chipping was easier and cleaner. Research and development engineers of the Aluminum Co. of America perfected this unique method of driving rivets.



View illustrating applications of Huck "Blind Lockbolts"

LATEST DEVELOPMENTS IN *Shop*

Sheffield High-Precision Gear Grinder

Production of an entirely new type of high-precision gear-grinding machine has been announced by the Sheffield Corporation, Dayton 1, Ohio. This machine is claimed to be capable of producing gears at an exceptionally fast rate and with uniform accuracy. The periphery of the wheel is formed with a helical rib by a combination of "Crushtrue" and diamond dressing operations. The gear blank is mounted on a mandrel between vertical dead centers, and rotates continuously at a set rate in direct relationship to the grinding wheel into which it is fed in an upward direction during the grinding operation. Work drive and grinding wheel drive are interconnected by gearing which can be changed easily as required by the number of teeth to be ground.

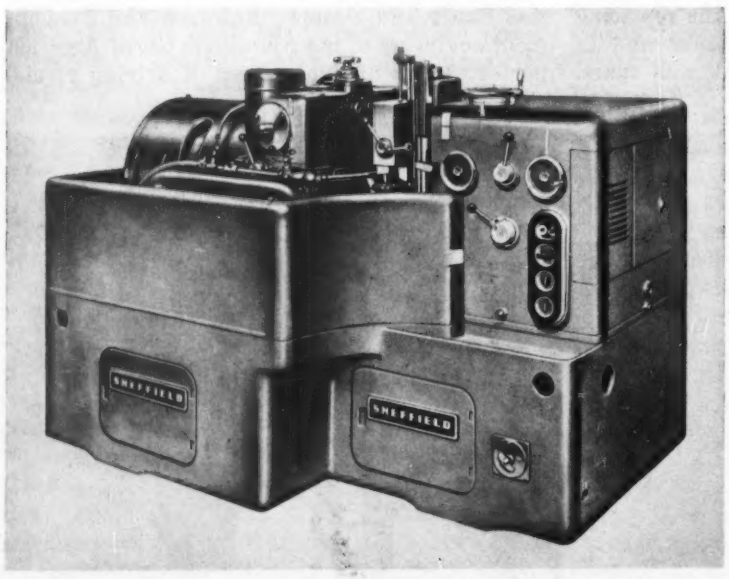
Work can be removed from the machine for inspection without stopping the grinding wheel. When replaced, the work is automatically located in the correct position. Two additional sets of gears provide for selecting the helical lead and for controlling the speed at which the work is fed past the wheel. The operation resembles gear hobbing with the helical ribbed wheel taking the place of the gear hob.

The work rolls across the full width of the wheel so that generation of the involute form is entirely automatic and is accomplished without further adjustment of the machine after its initial setting. The need for indexing is eliminated. The continuous rolling motion distributes wear evenly across the full face of the wheel, preserving the accuracy of the full wheel form so that frequent redressing operations are unnecessary.

The machine will accommodate gears up to 8 inches in diameter and with a maximum face width or tooth length of 4 inches. Gears from a minimum of 50 diametral pitch to a maximum of 8 diametral pitch or 0.4 circular pitch can be ground. Quantities of gears of 16 diametral pitch and finer can be ground simultaneously from the solid. Helical gears can be ground which have a maximum helix angle of 45 degrees. Helical and spur gears of the same pitch can be ground with the same wheel, without redressing or changing the wheel form. The helical ribbed wheel enables gears of any diameter and similar diametral, circular, or module pitches to be ground without additional setting up of the machine, except for changing the gears for the proper number of teeth and repositioning the wheel for the new diameter.

Accuracy of the work depends greatly on the accuracy of the helical ribbed form on the grinding wheel, which is produced initially by preformed "Crushtrue" dressing and then finished to extreme accuracy by diamond dressing. Both the "Crushtrue" and diamond dressing operations are performed automatically.

This Model 140 machine is the outgrowth of a similar machine made by the Coventry Gage & Tool Co., Coventry, England, which the Sheffield Corporation has redesigned and developed for the home market.



Sheffield Model 140 gear grinder designed to produce gears at a fast rate and with constantly maintained uniform accuracy

Equipment

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

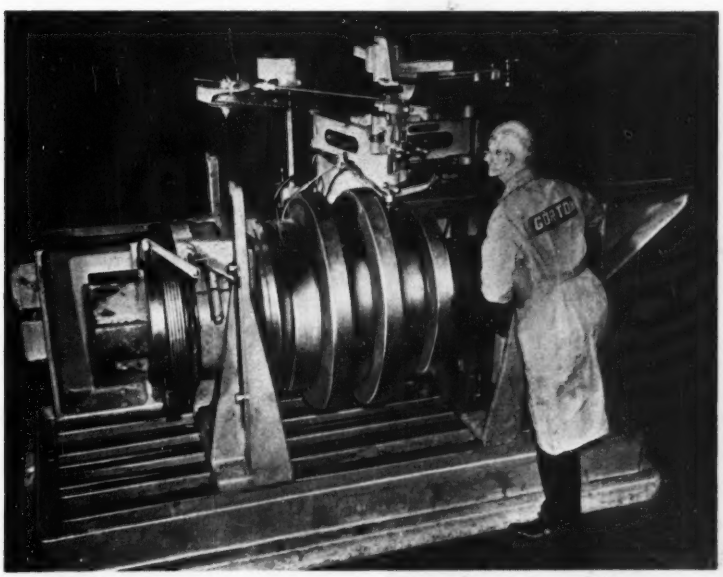
Tracer-Controlled Machine for Engraving Heat-Treated Rolls

A tracer-controlled pantograph engraving machine which will accommodate rolls up to 36 inches in diameter by 12 feet long has just been announced by the George Gorton Machine Co., 1309 Racine St., Racine, Wis. It is claimed that this machine will satisfactorily mill and engrave the surfaces of large rolls which have been heat-treated to give a hardness reading of 50 on the Rockwell C scale if the steel is not too tough. Cutting steel of this surface hardness is made possible through the use of a cutter especially designed for the purpose and the selection of speeds, feeds, depth of cut, and coolant best adapted for the work. If the roll or piece to be engraved is both hard and tough, considerable test cutting must be done before any conclusions can be reached as to how the job should be handled. Previous to the development of the roll engraver, the marking was done in various ways, including stamping and hand chiseling. It was to eliminate such tedious work that the ruggedly built pantograph machine illustrated was developed.

The new P-32 roll engraver shown in Fig. 1 is the smaller of two models now available. It accommodates rolls up to 36 inches in diameter by 7 1/2 feet long. This machine was designed for engraving letters and numerals on large rolls used in forming I-beams, railroad rails, and reinforcing rods of the kind used for concrete work.

A standard Gorton P-32 two-dimensional "Pantomill" of extra heavy construction, with a special saddle between the supporting rail and the pantograph mechanism, is used. The pantograph can be moved along the dovetail slide by means of a large handwheel, and can be securely clamped in any desired position.

An advantage of this roll engraver is that lettering, numbering, or other designs can be engraved on the curved surface of heat-treated rolls by using flat copy or master patterns. These masters can be made of steel, sheet iron, brass, wood, or plastic, depending upon requirements. If an allover (intaglio) design is required, only a segment of the complete design is made into a



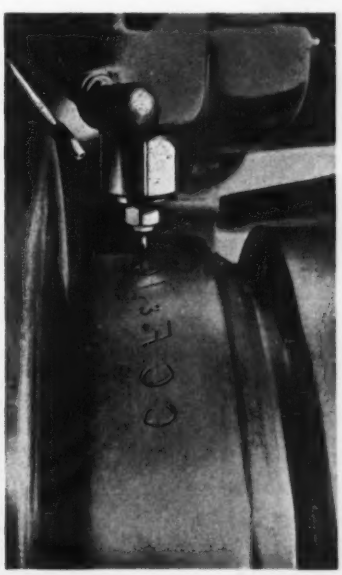


Fig. 1. (Left) Gorton tracer-controlled roll engraving machine. Fig. 2. (Right) Close-up view of engraving work performed on large heat-treated roll by machine shown at left.

master. Then the design is cut in the roll by indexing to each new position in order to create a continuous pattern. Another advantage is provided by the pantograph reduction ratio between tracing stylus and cutter. When an enlarged master is used and the pantograph ratio is set at 3 to 1 or 6 to 1, the amount of effort needed to trace the master is reduced by 3 in the first instance, or by 6 in the second as compared with the amount of effort required at a 1 to 1 ratio.

A forming guide mounted above the cutter spindle and shaped to conform to the curvature of the roll is in direct contact with the "former point" at the top of the spindle during operation of the machine. As the cutter moves in a lateral plane, actuated by the tracer spindle and pantograph linkages, the forming guide forces the cutter spindle to follow the curvature of the roll in a vertical plane. Micrometer stop-screws are provided for accurate positioning.

While the machine illustrated is manually operated, automatic or motorized masters can be employed in certain cases. Likewise, an automatic cam-operated down feed can be provided for the spindle as well as automatic rotation or indexing of the work.

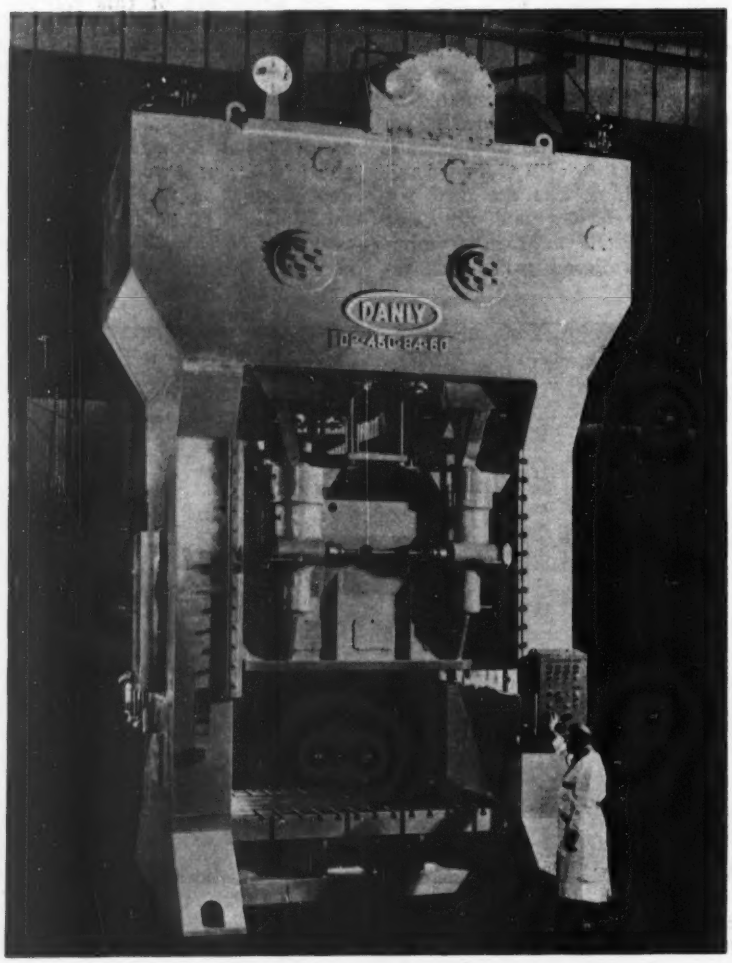
Danly Double-Action Press

Some interesting features have been incorporated in a 450-ton double-action straight-side press recently built for a large automotive company by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. For example, a "Dynamatic" clutch varies the linear stroking speed during the press cycle. Waste motion is eliminated so that the press operates at the comparatively fast rate of fourteen strokes a minute. This high over-all stroking rate is accomplished by accelerating the part of the cycle not actually involved in the drawing work. Slide speed during the effective draw is held to the desirably slow speed of 60 1/4 feet per minute. With this type of drive, the press has improved cycle characteristics for drawing work while operating about half again as fast as a conventional double-action press of comparable tonnage rating and stroke length, thus increasing the production capacity a corresponding amount.

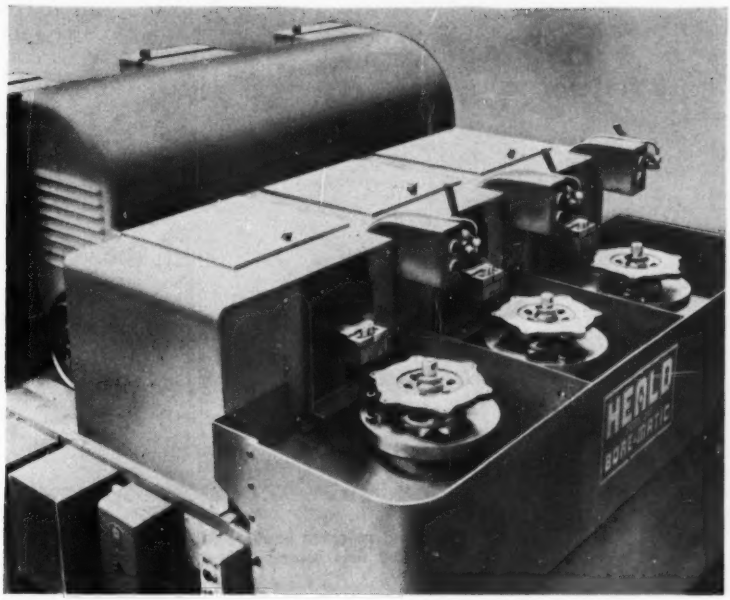
A motor adjusted blank-holder is another feature of this press. Motor adjustments are furnished for both the inner and outer slides. This arrangement is unusual in that most double-action presses have hand adjusted outer slides. In addition, the outer slide, or blank-holder, has a provision for a 1/4-inch pinch adjustment which can be made at each corner of the blank-holder. This feature enables the press user to vary the blank-holding pressure at the corners to allow for uneven draws.

This press has a central automatic lubrication system. An oil pump and filter unit distributes clean, circulating oil to all working members of the drive. Oil is piped under pressure to the anti-friction bearings of the flywheel and drive-shaft, as well as to the gear teeth. Slide connections are also lubricated from this central system. A Danly oil pressure safety switch monitors oil lines to the pressure lubricated bearings of the flywheel and drive-shaft so that if any one of these lines should become clogged, the press will stop automatically and the switch will clearly indicate the faulty line.

The press can be installed without a pit, thus making it possible to move it from one position to another without major installation changes. The bed of the press rests directly on the floor and is shallow enough to permit loading and unloading work at the proper operating level.



Double action straight-side press built by Danly Machine Specialties, Inc., for use in automotive plant



"Bore-Matic" developed for rapid machining of clutch plates

Heald "Bore-Matic" Developed for Clutch Plate Production

A vertical spindle, cam-operated three-station Model 243 "Bore-Matic" has been developed by the Heald Machine Co., Worcester 6, Mass., for use in the rapid production of clutch plates. This machine is designed to perform multiple precision facing and step facing operations on clutch plates, bell housings, flywheel assemblies, and other similar parts. The three stations may be set up for simultaneous or progressive production runs, and loading on any station may be done while the others are operating.

Also available for similar high-production operations on a smaller scale are the Model 241 single-station and the Model 242 two-station vertical spindle "Bore-Matics." Cams operating the tool-slides control the cutting speed of tools as well as the stroke. A wide range of machine cycling is available, which depends on the number of different cams provided.

Tool adjustment is easily accomplished by positioning index marked screws on top of the tool-blocks, and may be done while other stations are operating. The rotating air-operated fixtures are mounted on vertically positioned boring heads with fixture clamp levers adjacent to each push-button control station.

Chip removal is simplified by a worm or screw type conveyor which gathers chips at the base of each station and deposits them in a pan conveniently located at the right-hand side of the machine.

Giant Size "Rotab" Work-Holding Table with Motor Drive

A 48-inch "Rotab" rotary work-holding table with motor drive has been brought out by the Machine Products Corporation, 6771 E. McNichols Road, Detroit, Mich. This machine is intended for machining or checking radial or angular work, and is said to be especially adapted for radial drilling machines and boring mill applications.

A push-button controlled motor rotates the 48-inch diameter table (or faceplate) at 5 R.P.M. This drive serves to simplify set-up of work. A handwheel can be used to complete the setting to precision accuracy within two minutes by vernier graduations on a scale below the table. The faceplate can be rotated and adjusted to any angle from the vertical to the horizontal position. It can also be tilted in the opposite direction to any angle up to 30 degrees below the horizontal. Provision is made for locking the table in any position.

The surface of the plate has eight equally spaced T-slots, each 11/16 inch wide. These slots extend to the outer rim to provide clamping facilities. This machine is provided with a centering plug and 10-inch sine bar. Marking rings are scribed in the faceplate to facilitate set-up. The over-all height to top of faceplate when



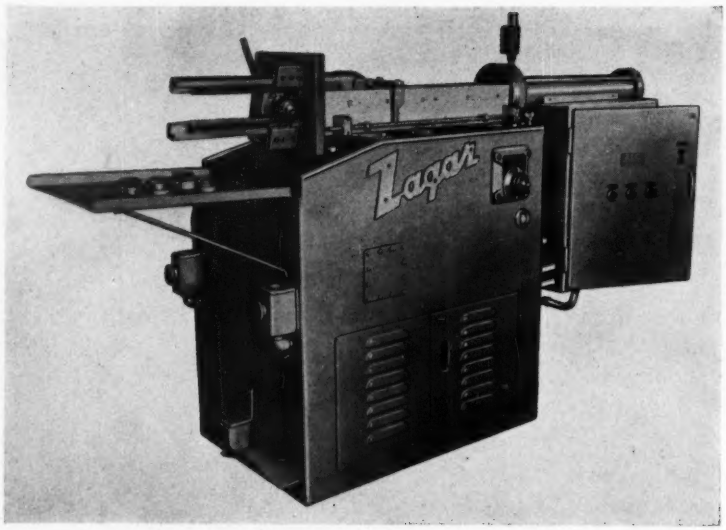
"Rotab" work-holding power-driven rotating table for machining or checking radial or angular work

in the horizontal position is 35 inches. Distance from base to center line of faceplate when in vertical position is 26 inches.

Abrasion Tester for Cylindrical Parts

The Taber Instrument Corporation, 111-M Goundry St., North Tonawanda, N. Y., has announced an abrasion testing machine for rating the wear resistance of protective finishes such as black oxidized or electroplated coatings, extruded plastic, and enamel. The illustration shows a 34-inch rifle barrel being tested to determine the amount of handling wear the metal part will withstand before the blue oxide finish is worn so thin that corrosion will take place.

The abrading head can be adjusted lengthwise of the barrel to any position within its range. Pressure of the abradant against the test surface is applied by a floating dead-weight load system, which compensates for minor inaccuracies of the test part. The cylinder abrasion tester is fully adjustable to take cylindrical specimens from 1/2 inch to 6 inches in diameter and from 8 to 36 inches in length. The width of the wear track is normally 1 inch. However, the face of the abrading medium can be narrowed to wear a track only 1/2 inch in width.



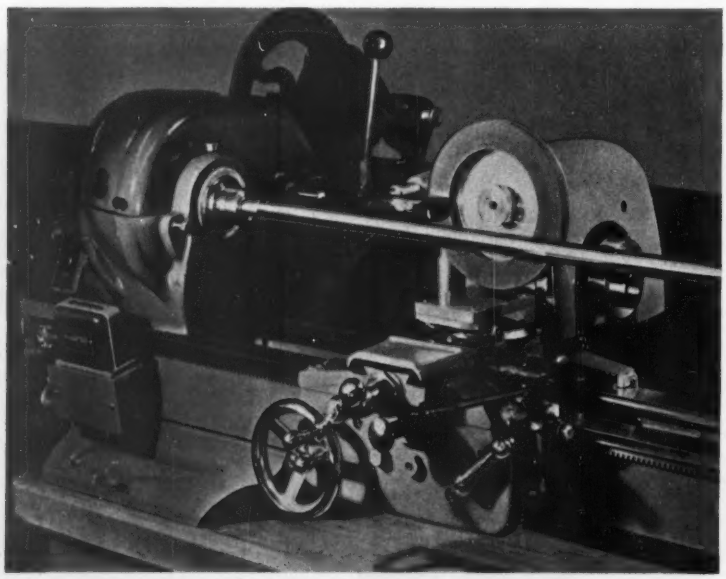
Zagar "Hyspeed" broaching machine equipped for broaching slots in shell fuse assemblies

Zagar "Hyspeed" Broaching Machine

A horizontal broaching machine designed for high-speed operation is being manufactured by Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio. The operator starts the machine cycle with a foot pedal, which leaves both hands free to handle the work. For operating convenience, the "start" pedal is made double-sided so that the machine can be controlled from either side. Two emergency "stop" switches permit the machine to be stopped quickly simply by a movement of either the knee or hand.

The machine is hydraulically operated and electrically controlled through a system built to J.I.C. standards. The electric control panel has a selector switch which can be set for an automatic return stroke or the conventional broaching stroke. The coolant system, built integral with the machine, pumps either light or heavy cutting solvents.

The broaching machine has a maximum pull of 6000 pounds and a maximum feed stroke which is variable between 2 and 27 feet per minute. The full return stroke of 20 inches requires one and one-half seconds. A floor space of 3 by 9 feet is required. Operation is at the rate of 700 strokes per hour. This machine is especially suited for high-production broaching of splines and wrench slots, the sizing of holes, and similar work in small and medium size work.



Abrasion testing machine brought out by the Taber Instrument Corporation

Brunner Liquid Chiller Designed for Industrial Applications

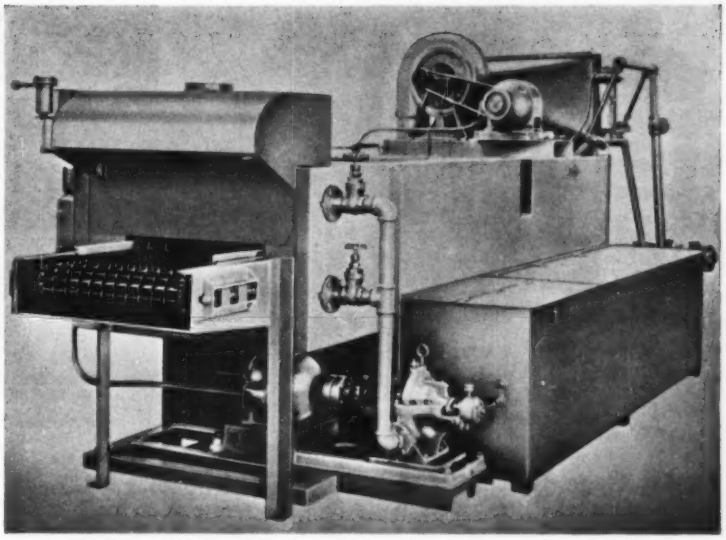
A liquid chiller for varied commercial and industrial applications is announced by the Brunner Mfg. Co., 1821 Broad St., Utica, N. Y. This new unit is an ice builder as well as a chiller, building up quantities of ice in

low-requirement periods for use during peak load demands. The interior of the cabinet is entirely lined with copper to eliminate corrosion. Galvanized steel of 16 gage (aluminum optional) is used for the cabinet exterior, with aluminum doors and 4-inch cork insulation. In the industrial field, this chiller is especially useful in cooling oils and grinding compounds on high speed machines so that it will be possible to hold work to closer tolerances.

Washing Machine for Cleaning Rocker Arm Shafts

A special washing machine for the removal of grease and chips from rocker arm shafts after they have been machined has been built by the Alvey-Ferguson Co., Cincinnati 9, Ohio, for a large automobile manufacturing plant. A unique feature of this machine is the special type of bar conveyor unit equipped with steel discs upon which the shafts ride. The discs hold the shafts in place with the maximum surface area exposed to permit fast, efficient washing and drying as the conveyor moves through the machine.

This machine utilizes the manufacturer's "A-F Super-Spray" cleaning system in which the shafts pass through consecutive high-pressure, fan-shaped curtains of cleaning solution directed from above, below, and both sides. A hot blow-off unit is used for drying. The tank has two screens, permitting one screen at a time to be removed for cleaning without interrupting operation of the machine. The screen tank removes foreign particles from the cleaning solution, and thus prevents the nozzles from becoming clogged.



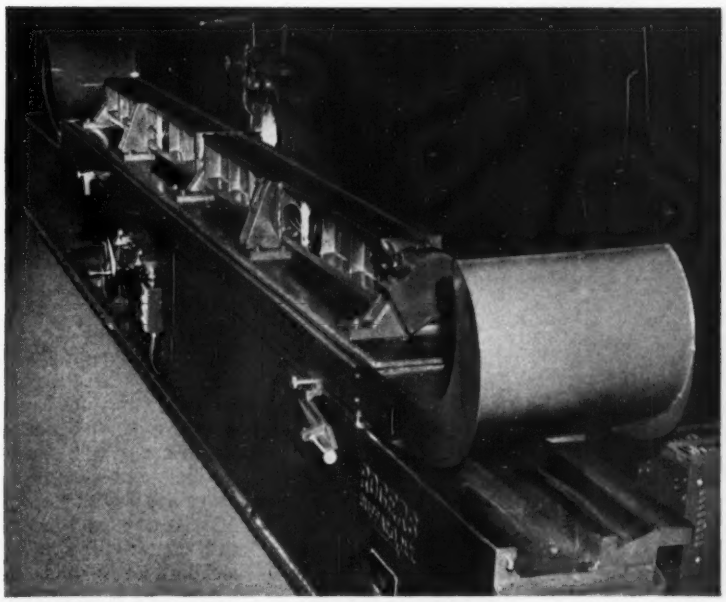
Special washing machine for cleaning rocker arm shafts, built by the Alvey-Ferguson Co.

Massive Knife Grinder with Hydraulic Fluid Motor Drive for High-Speed Table Travel

Samuel C. Rogers & Co., 183-205 Dutton Ave., Buffalo 11, N.Y., has just announced the completion of a massive, 12-ton knife grinder with a new hydraulic fluid motor drive. This machine is particularly adaptable for fast grinding of shear blades and paper, veneer, chipper, and other heavy-duty knives. In addition, it can be employed for flat face, bevel, and edge grinding.

The work-table is 184 inches long, and is equipped with a magnetic chuck designed to speed up work loading and unloading. Although the work-table weighs as much as 4 tons, the new fluid drive will move the table and work past the grinding head at speeds up to 100 feet per minute, gaining this speed after traveling only a foot from the dead stop position. It is claimed that the machine can grind to a tolerance of 0.0015 inch despite the high work speed.

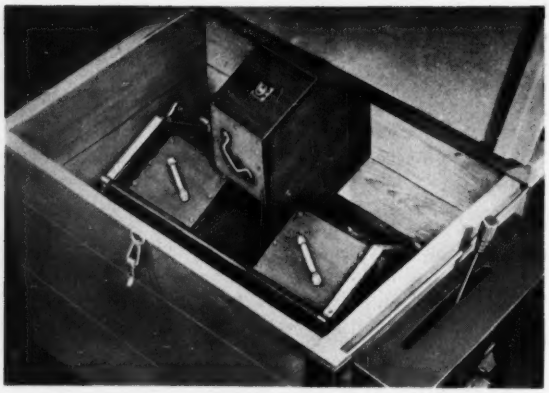
The equipment includes Rogers newly designed control switches, a grinding wheel of the segmental type, and a 25-H.P. heavy-duty, ball bearing motor. A heavy-duty coolant system is attached for use in obtaining proper cooling of the work.



Massive knife and face grinder with hydraulic fluid motor drive and magnetic chuck, built by Samuel C. Rogers & Co.



DoAll "chromium-carbide" gage blocks



"Pocket Tumbler" for finishing small parts

DoAll Gage Blocks Made of "Chromium-Carbide"

Gage blocks are now being manufactured by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., from "chromium-carbide," a recently developed material that provides ideal characteristics.

The new blocks have a coefficient of expansion practically identical to that of steel. Consequently, it is not necessary to allow for thermal expansion and contraction in measuring steel parts. Because of this, the blocks may be used interchangeably with steel blocks taken from another set.

The longer life or greater wear resistance of the "chromium-carbide" gage blocks is said to result from the superior surface finish obtainable with this metal and its inherent resistance to oxidation and corrosion. It will not oxidize at temperatures up to 1000 degrees F., and resists perspiration and acids normally encountered in the shop.

The new blocks will not "grow" or "shrink" with age, and if accidentally dropped, they do not change size from internal structural changes caused by instability. These DoAll "DC" blocks are being offered in A and B grade accuracy in 83-, 37-, 35-, and 8-piece sets covering a size range of from 0.010 inch to 20 inches.

Tumbling Barrel for Finishing Small Parts

Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y., has announced a tumbling barrel having individual "pockets" for tumbling from two to six pieces at a time. Typical items for which the tumblers can be used include jewelry findings, ornaments, stampings, screw-machine parts, gears, etc.

The tumbling barrel comprises a rotating container, or "frame," into which the pockets fit. Both the pockets and the frame are hexagon-shaped. The frame is enclosed on five sides during tumbling to hold the pockets in place.

Automatic Screw Machine with Interchangeable Cam Units for Quick Change in Set-Ups

Interchangeable cam assembly units that can be pre-selected and assembled for the next job, while one job is being run, substantially reduce set-up and down time on the BMW single-spindle automatic screw machine built in Germany, and being introduced in the United States by Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.

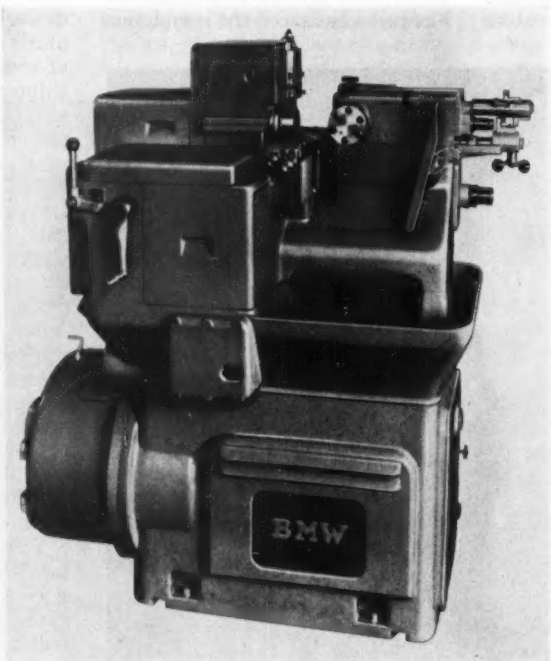


Fig. 1. Automatic screw machine introduced by Kurt Orban Co., Inc.

The cam assembly unit shown in Fig. 2 includes cams for the longitudinal feed of the turret, cross-feed for the front and rear cross-slides, turret indexing, collet actuation, and feeding stock. It also includes as standard equipment tripdogs for changing the direction of work-spindle rotation. Both cams and trip-dog discs are divided into 100 graduations and the drive rings are designed with 100 serrations to permit rapid and correct setting. Cams and tripdogs are positively locked in position in order to assure exact

size control and accurate timing.

This machine is built to inch dimensions and is designed to combine high-speed production with maximum precision. The short rigid work-spindle is mounted in precision anti-friction bearings, belt-driven between bearings, and can be run up to 5800 R.P.M., enabling full advantage to be taken of modern cutting tools. All slides have micrometer adjustment. Collets and cams are interchangeable with American-built equipment. The bar capacity is 7/8 inch, and the maximum turning length is 1 3/4 inches. Attachments are available for high-speed drilling, cross-drilling, recess boring, and slotting.

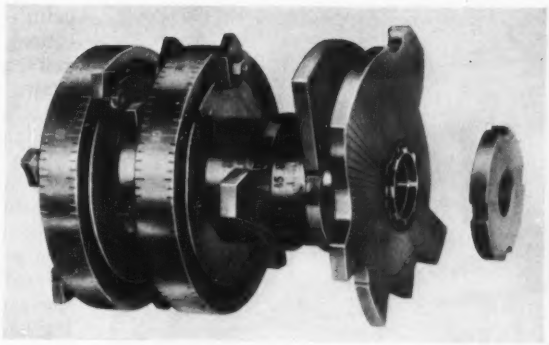


Fig. 2. Interchangeable cam unit for machine shown in Fig. 1

"Di-Acro" Bender for Heavy Forming

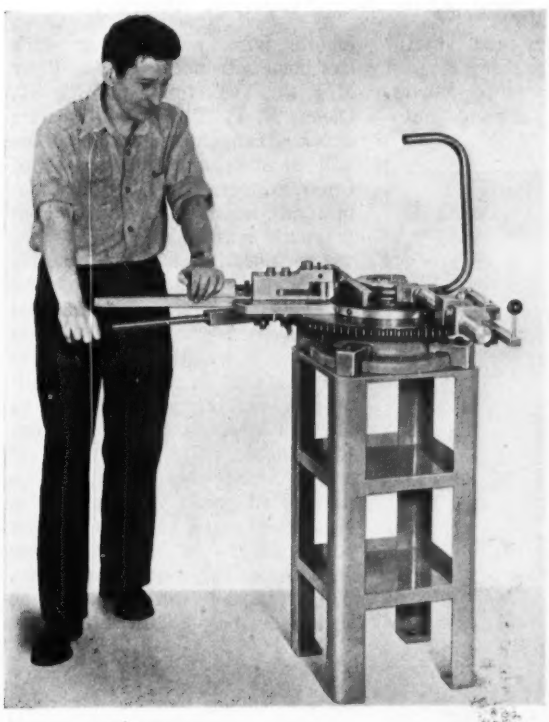
A hand-operated bending machine which will bend cold-finished steel bars up to 1 inch in diameter and tubing in sizes up to 1 1/4 inches, or their equivalents, has been added to the "Di-Acro" line of precision metal-working machines built by the O'Neil-Irwin Mfg. Co., 559 Eighth Ave., Lake City, Minn. This No. 4 bender is designed for heavy bending operations where production does not warrant the use of a power-driven machine. It offers a radius bending range of from 0 to 12 inches.

A feature of this machine is a built-in ratchet mechanism which can be engaged or disengaged by the operator depending upon the size of the material being formed. Engaging the ratchet mechanism increases the material capacity of the bender, multiplying the force exerted by the operator about four times, so that larger and heavier size material can be bent.

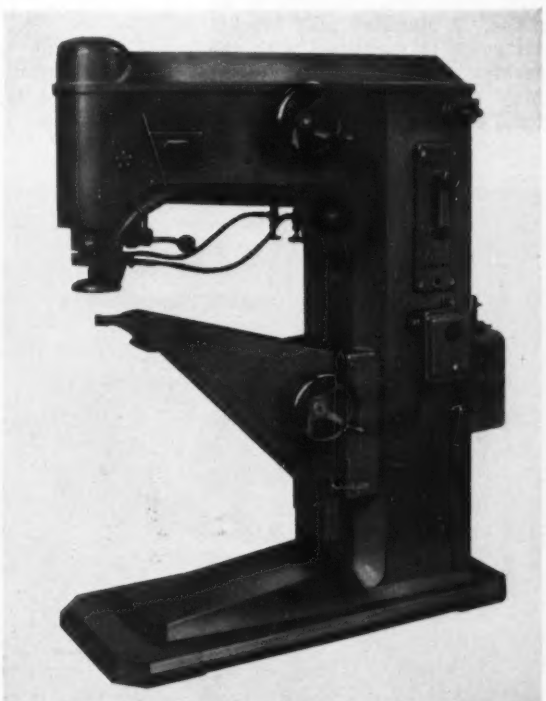
By disengaging the ratchet and using the bender in direct drive, the operator can step up the production of lighter materials. The bender can be quickly changed over from one forming operation to another. It provides a method of producing one or many simple or complicated parts. A special stand is available for the bender, as are accessories for use in bending tubing, angles, channels, extrusions, moldings, and strip stock, bus bars, round or square rods, and various other solid ductile materials.

Horn Type Routing Machine

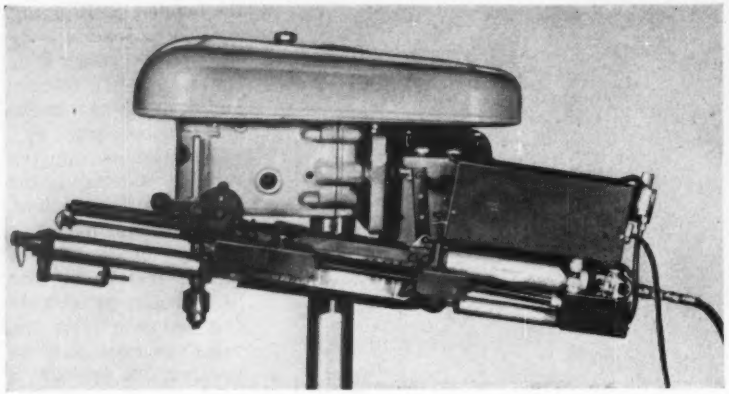
A horn type router designed for a wide range of trim routing operations on non-ferrous metal parts requiring an unusually large swing clearance has been announced by



"Di-Acro" bending machine with ratchet mechanism



Horn type router brought out by Ekstrom, Carlson & Co.



"Sensitorque" drill press feed manufactured by the Bellows Co.

Ekstrom, Carlson & Co., Department M-4, 1400 Railroad Ave., Rockford, Ill. This new machine, designated the "ECCo No. 434H" horn router, can be equipped with a 3-, 5-, or 7 1/2-H.P. 3600-R.P.M. motor. The design of this machine makes it especially adapted for use in aircraft plants.

Spindle speeds of either 10,000 or 20,000 R.P.M. are easily obtained by means of a two-step drive pulley arrangement. An adjustable three-position positive depth stop has been built in for use in precision step routing. The minimum clearance between the collet chuck and the horn is 10 inches. A standard pilot bracket and guide is furnished with the machine. An air-operated coolant spray attachment, which is optional equipment, can be supplied.

Drill Press Feed Designed to "Feel" its Way Through Work

The "Sensitorque" drill press feed manufactured by the Bellows Co., 230 W. Market St., Akron 9, Ohio, provides a new approach to the solution of drill breakage problems encountered in deep-hole drilling. This feed does not depend upon any predetermined timing cycles for its operation. By measuring the torque on the drill, it "senses" the cutting conditions at the bottom of the hole and causes the drill to be withdrawn only when the strain approaches the danger point, thus eliminating needless withdrawals.

The "Sensitorque" drill press feed illustrated consists of a "sensor" cabinet mounted on a standard Bellows drill press feed. The sensing unit employs rugged aircraft type relays, no electronic tubes or complicated circuits being used. If the drill, even though it is as small as 0.094 inch, becomes clogged with chips, runs dry of coolant, hits a blow-hole, or seizes in any way, an electrical impulse is instantaneously sent to the drill press feed which causes the drill to be withdrawn, and then immediately and rapidly returns it to the working position. It will repeat this operation until the job is completed.

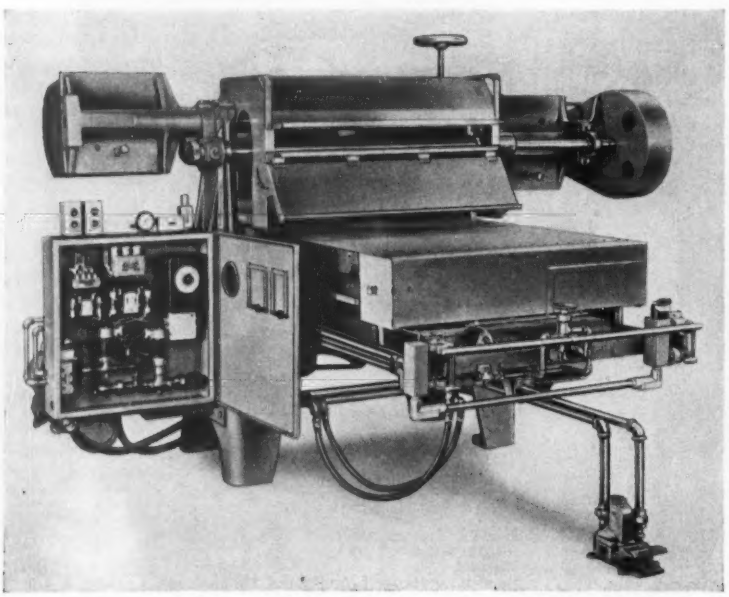
The length of the drill withdrawal stroke is adjustable for all the way out of the hole, or for as short a distance as desired. On the return or downward stroke a Bellows "Hydro-Check" stops the drill just before it hits the bottom of the hole and gently advances it to the work.

Surface Finishing Machine with Vacuum Chuck for Holding Thin Non-Magnetic Work

A machine developed specifically for surface finishing formed decorative nameplates for stoves, refrigerators, appliances, automobile trim, and similar work has been introduced by the Clair Mfg. Co., Inc., 1029 S. Union St., Olean, N. Y. Through a vacuum chuck arrangement, this machine will handle nameplates made of brass, copper, silver, plastic, aluminum, wood, and other non-magnetic materials.

The machine has all controls assembled at a central control panel contained in a strong metal case, located where it is not exposed to abrasion from the polishing compound. Motors are available in varying speeds up to 15 H.P. in size. Buffs are 9 inches in diameter.

The work-table consists of a perforated plate mounted over a sealed air space, this space being connected to a vacuum pump through a four-way spring valve. The standard work-table is 36 inches deep by 38 inches wide.



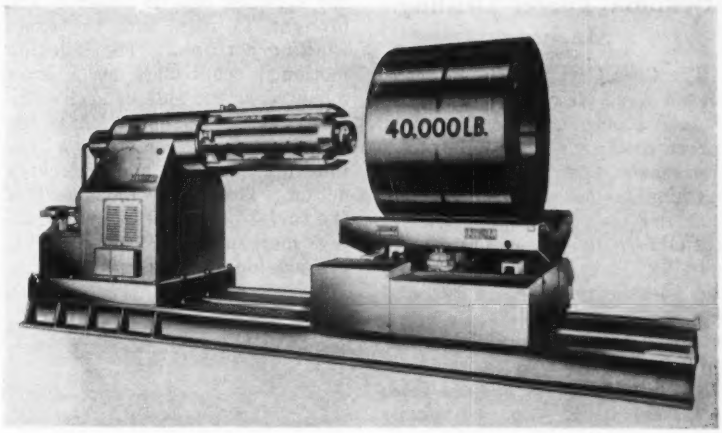
Surface finishing machine with chuck for holding non-magnetic parts, brought out by Clair Mfg. Co., Inc.

Littell Heavy-Duty Automatic Centering Reels

The F. J. Littell Machine Co., 4143-H Ravenswood Ave., Chicago 13, Ill., is now building extra heavy-duty automatic centering reels for coiled stock in 5-, 10-, and 20-ton capacities. These spindle type reels protect the stock against rolled-over edges and damaged surfaces. They have arms which are contracted and expanded by means of hydraulically actuated cams within the spindle. As the spindle sleeve is pushed forward, the arms contract to the minimum diameter. When the sleeve is pulled toward the frame, the arms spread until the coil is gripped tightly.

The cams on the sleeve and on the arms are interlocked to hold the arms in place in both the expanded and the contracted positions. The simultaneous expansion of the arms serves to accurately center the coil.

The V-type coil-loading car rides on a track base which can be extended from machine to coil storage area to permit conveying material to the reel without intermediate handling.



Centering reel with coil-loading car brought out by F. J. Littell Machine Co.

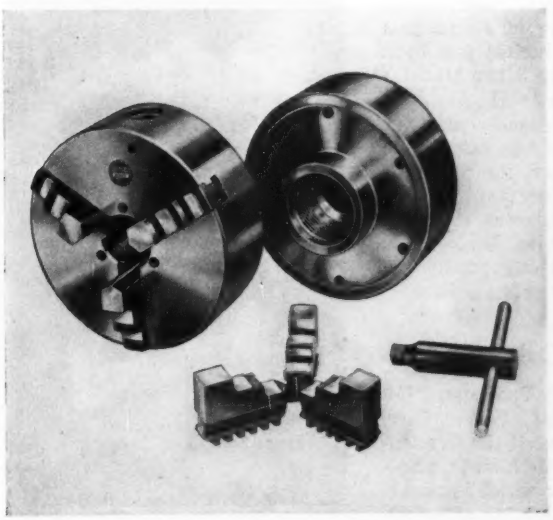
Wescott Universal Lathe Chuck

The latest addition to the line of lathe chucks made by the Westcott Chuck Co., Oneida, N. Y., is the No. 6907 6-inch three-jaw universal chuck with threaded body for direct mounting on lathes, milling machines, grinders, and other machine tools having spindles with 2 1/4–8 threads. Since no adapter is required, the chuck is held close to the spindle bearing to minimize chatter.

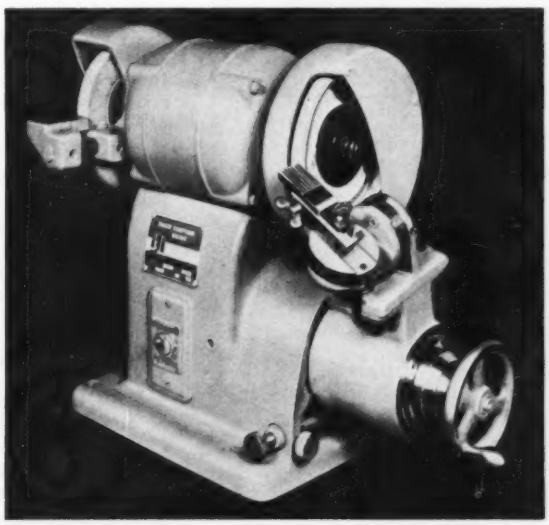
Jones & Lamson Universal Bench Type Chaser Sharpening Machine

A low-cost, space-saving machine specifically designed to resharpen chasers, thus freeing heavy expensive machine tools for their intended uses, has been brought out by the Jones & Lamson Machine Co., Springfield, Vt. This machine is equipped with the new J & L chaser grinding fixture and adapters designed to do an outstanding job on all sharpening operations, for both tangent and radial die chasers. Adapters for J & L chasers are available from stock, while adapters for other chasers can easily be applied to this fixture.

The machine will duplicate any desired grinds repeatedly. It is a precision type machine tool, and is equipped with all necessary stops and controls. Simple, direct methods speed up operation, cut costs, and make it easy for inexperienced operators to learn to resharpen chasers.



Three-jaw lathe chuck with threaded body developed by the Westcott Chuck Co.



Universal bench type chaser sharpening machine built by Jones & Lamson Machine Co.

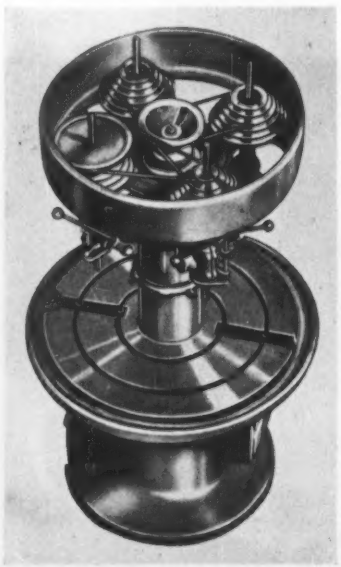
Bekoma Turret Drilling Machine

The Cosa Corporation, 405 Lexington Ave., New York 17, N. Y., is introducing in this country a turret drilling machine made by Diedesheim, of Germany. This machine is designed for production drilling operations, and is available with either four or six spindles. It is driven by one motor, and the spindles are mounted radially on a circular carrier, which revolves around the center column.

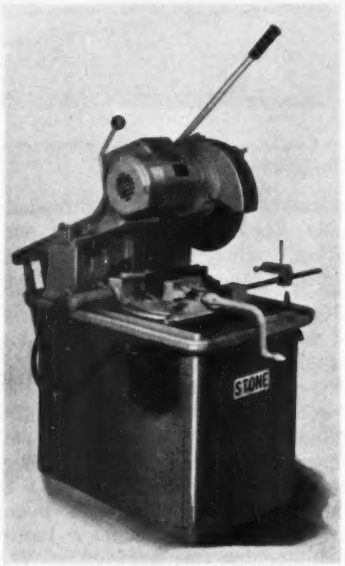
Each spindle has a hand feed, adjustable depth stop, and spindle return spring with variable tension. A central V-groove pulley drives each spindle independently. The torque to the spindles is transmitted through hardened spline shafts. By using adjacent spindles as intermediate countershafts, twenty-four spindle speeds, ranging from 28 to 1500 R.P.M. or 56 to 3000 R.P.M., can be obtained.

Spindles have a No. 2 Morse taper and take drills up to 23/32 inch in diameter. Spindle travel is 5 inches and vertical adjustment, 6 inches. The maximum distance between spindles and table is 16 inches, and the distance between spindles and column is 6 3/4 inches. This machine can be equipped with multi-spindle heads or tapping attachments.

Work-pieces need not be moved from one spindle to the next, as the spindles can be indexed and brought, in turn, into the exact working position. The indexing motion is controlled by a lever mounted at the side of each spindle. One movement releases the index block, accomplishing the indexing motion and relocking action. The rotary movement of the turret is controlled by a braking mechanism, which prevents overloading the indexing pin.



Turret drilling machine introduced by the Cosa Corporation



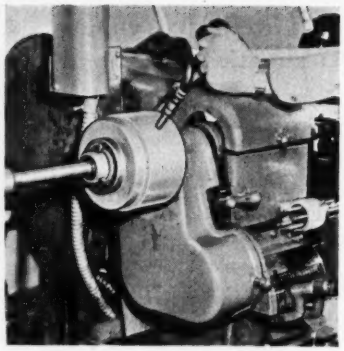
Cutting-off machine improved by the Stone Machinery Co.

Stone Cut-Off Machine

An improved cut-off machine designed for heavy, continuous production cutting of all ferrous and non-ferrous metals has been brought out by the Stone Machinery Co., 640 Fayette St., Manlius, N. Y. The principal change in this M75 machine has been made in the cutting head, the power of which has been increased from 5 to 7 1/2 H.P. A work stop and an air-activated vise developed to facilitate increased production are available for this machine.

Pneumatic Collet Closer

Williams Metal Products, 3713 S. Robertson Blvd., Culver City, Calif., has announced the development of the "Wil-Numat" pneumatic collet closer which is adaptable to both production and toolroom operation of turret lathes, engine lathes, automatic screw machines, and similar collet-equipped machines of 1/2- or 1-inch collet capacity. This collet closing unit can be easily installed in a few minutes without making any alterations in the machine. The complete unit includes collet closer, air regulator, and valve.

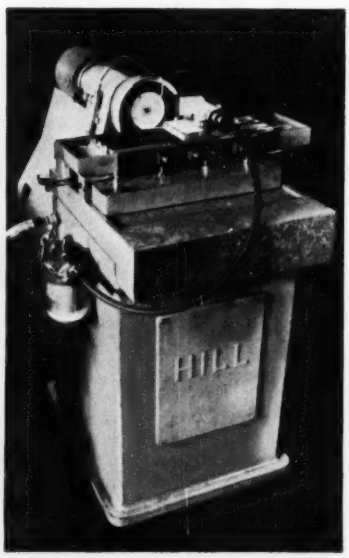


Lathe equipped with "Wil-Numat" pneumatic collet closer

Just a flick of the valve lever is all that is necessary to instantly lock the work in position. There is said to be no vibration, slamming, or jarring of the stock when using this collet.

Automatic Face-Grinding Machine

An automatic face-grinding machine that can also be used for lapping has been developed by the H. M. Hill Machine Works, 98



Face-grinding or lapping machine built by H. M. Hill Machine Works

Schor Ave., Leonia, N. J., for the precision finishing of flat surfaces on small parts at high production rates. It has a variable-speed hydraulically operated table that provides a steady traversing motion of the work at right angles to the grinding head. The in-feed, which is also hydraulically operated, maintains a constant pressure against the wheel until the adjustable stop is reached.

After loading the work-holding fixture, the operator presses a button which starts the machine, causing the work to move from the loading position to the working position, reciprocate across the face of the wheel and feed toward a fixed stop, remain fixed for an adjustable spark-out period, retract from the wheel, and return to the loading position. A timing clock is provided which times cycles from ten seconds to twenty minutes.

Machine Designed to Cut Two Miters Simultaneously

The Approved Devices Co., 525 Woodward Ave., Detroit 26, Mich., has developed a high-production mitering machine which cuts two 45-degree miters simultaneously. The machine is adapted for cutting plastic, wood, or aluminum molding. A steel scale is provided for setting the length gage. The cuts are made by two 7-inch steel saws placed close together to prevent waste. A 1/3-H.P. 115-220-volt 1725-R.P.M. motor drives the ball-bearing spindles on which the saws are mounted. Operation is by foot- or hand-lever. The machine is 44 inches long, 24 inches wide, 48 inches high, has a worktable 34 inches high, and weighs 190 pounds.

Carlson Wire Cutting Machine

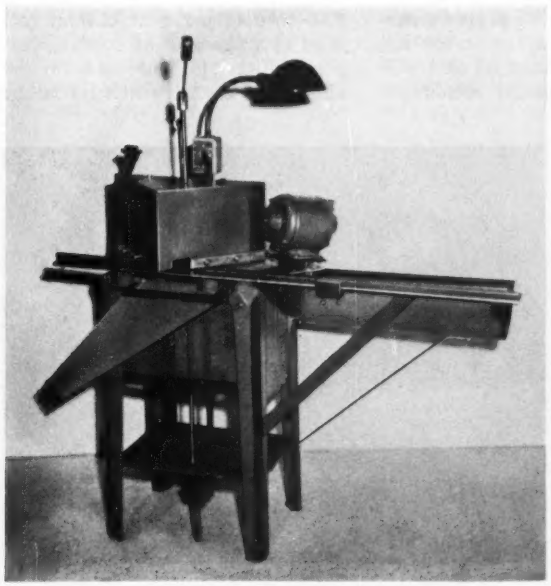
A heavy-duty machine for cutting black tempered and other kinds of straight wires is announced by the Carlson Tool & Machine Co., Geneva, Ill. Features of the machine include high production capacity, long-life tooth type cutters, and easy set-up for adjustment of wire length to be cut. This Model 51 wire cutter is 62 inches long, 30 inches wide, 57 inches high, and weighs approximately 1700 pounds. It has a maximum cutting capacity of 150 pounds per hour, and can be set to cut any length of wire required. The cutting is done by two rotary tooth-type cutters. These cutters are 8 inches in diameter and are made of ground high-speed steel. The 3-inch turned and ground shafting runs in Oilite and ball-thrust bearings. Power is supplied by a 3-H.P. three-phase, 60-cycle gear-head motor.



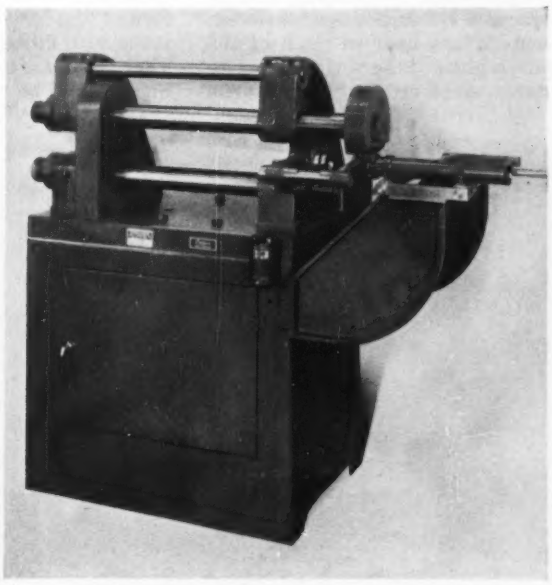
"Roto-Finish" work and chip separator

"Roto-Finish" Machine with Work and Abrasive Chip Separator

A mechanical-magnetic type of separator especially developed to separate work from abrasive chips where both ferrous and nonferrous parts are processed using "Roto-Finish" methods has been announced by the Roto-Finish Co., 3700 Milham Road, Box 988, Kalamazoo, Mich. A unique feature of this machine is that the magnetic and mechanical separating mechanisms are interchangeable on the portable frame. Thus it can be used either as a mechanical or as a magnetic separator.



Mitering machine built by Approved Devices Co.



Carlson heavy-duty wire cutting machine

When used for mechanical separations, the mixed parts and processing media pass over a motor-driven, agitated separator screen. Separation is made as the over-size parts are discharged from the top of the screen, while processing chips go through the screen and discharge into a hoist pan.

With the magnetic separating unit, parts and chips pass over a magnetic pulley. Parts are separated magnetically and then conveyed to a container, while the chips fall into a hoist pan.

Sine Plates for Precision Lay-Out and Inspection Work

Sine plates with large working surfaces for precision checking of angles on large pieces, are now being manufactured in 5- and 10-inch sizes by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. The top surfaces of these plates are 6 by 6 and 7 by 12 inches, respectively. The broad working surfaces of the plates facilitate the handling of difficult jobs such as checking compound angles and the angles of sine chucks. For such work the 5-inch plate can be used in conjunction with another 5-inch plate or with a 10-inch plate. Also, either size plate can be used with a 5-inch sine bar.

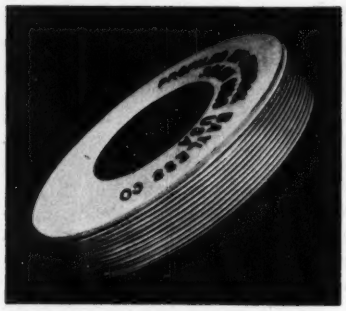
A notable feature of these sine plates is the "three-point" base arrangement. Two short cylinders, spaced 5 1/4 inches apart between centers, are used in place of the single-piece base cylinder commonly employed in sine fixtures. This arrangement is said to minimize errors which often occur when long cylinders are used.

The lapped and serrated working surfaces of the 5-inch sine plates are held flat and square within 50-millionths inch, and the 10-inch plate within 75-millionths inch. Over-all accuracy of the plates, including such factors as parallelism, spacing, and roundness of cylinders, etc., is held within the tolerances designated by the National Bureau of Standards and the proposed Military Specification MIL-S-4458 (USAF) for sine bars and plates.

The oil-hardening tool steel used for the plates is hardened, drawn, and stabilized to maintain accuracy. Tapped holes are located in the side and end of the plates to accommodate clamping fixtures. Holes are also provided through the working plate for locating dowels or fastening screws.

Worm-Face Profile Gear-Grinder Wheel

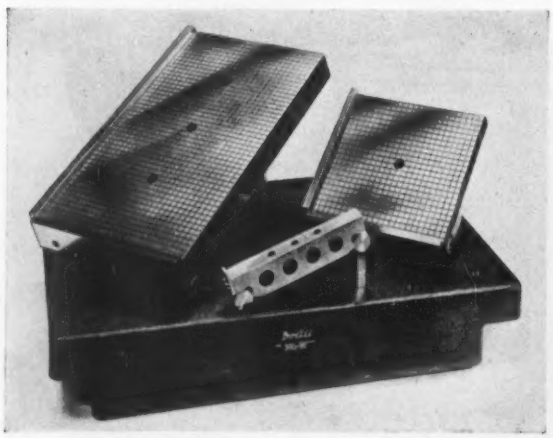
The Jerpbak-Bayless Co., Solon, Ohio, is placing on the market through its distributor, the Crown Tool & Supply Co., 155 Bell St., Chagrin Falls, Ohio, a line of worm-face profiled gear-grinder wheels, in popular make gradings and pitches. The grinding wheels in this line have been developed to cut set-up time to a minimum and reduce production time. These profiled wheels are accurately formed and have the proper clearances to minimize root crushing. They require a minimum of dressing, and can be readily remounted on a machine because the worm face profile is held square and parallel with the bore and face. Each grinding wheel is marked with the proper pitch and form for easy identification.



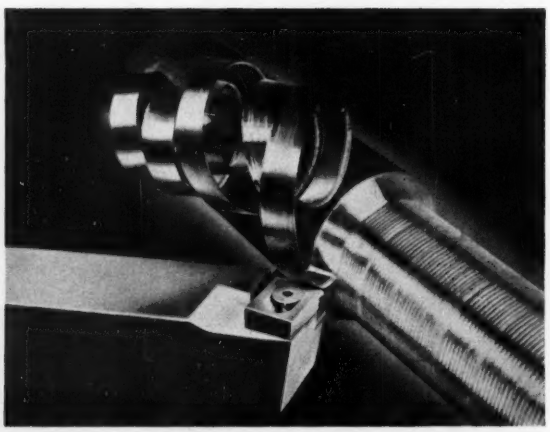
Worm-face profile gear-grinding wheel distributed by the Crown Tool & Supply Co.

Turning Tool Designed for Heavy Cuts

A new "clamp-on" type turning tool known as "Hefti-Cut" has recently been placed on the market by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. This tool is said to give outstanding performance in turning, facing, and shaping, as well as in the boring of large holes. It is especially adapted for use in reducing large work to rough-turned size preparatory to taking finishing cuts. For example, it will take cuts 1 inch deep at a feed of 3/16 inch in 0.40 to 0.41 per cent carbon tool steel at a speed of 88 surface feet per minute. The tool has a rugged alloy steel shank which holds the



Sine plates for precision lay-out and inspection work manufactured by DoAll Co.



Turning tool designed for taking heavy cuts brought out by the DoAll Co.

carbide blanks by a new method designed to achieve rigidity yet permit maximum resharpening before the tip must be replaced.

It is claimed that heavier cuts can be taken without cracking the carbide tip because the blank can expand independently of the anvil as it becomes heated. This feature also allows a harder grade of carbide to be used successfully. The improved shank design with offset anvil provides solid support, thus reducing the tendency for the shank to twist in the holder when excessive pressure is exerted against the tool tip. Provision for removing blanks from the tool without removing the shank from the holder helps to reduce the down time of the machine for tip replacement or resharpening. The "Hefti-Cut" tool is made in three styles (offsets) for various turning, facing, and heavy shaping and boring operations.

Dillon Electrical Indicating Dynamometer

The latest addition to the line of traction dynamometers manufactured by W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill., is known as Model "EL." This dynamometer can be made to operate electrical warning signals, relays, switches, motors, etc. It can be set for any loading point between 0 and 100,000 pounds. A 5- or 10-inch diameter dial is optional. Other features include a red hand for indicating maximum reading, and overload protection. The dynamometer is available in thirteen different capacities.

A blue hand provided on the dial is adjustable to any load desired. As the load is imposed, a white pointer moves forward until it reaches the desired point, thereby closing contact with the blue hand.

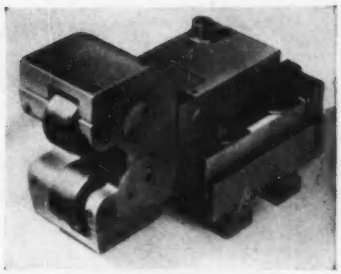
Reed Thread Rolling Attachment

A thread rolling attachment designed for use in automatic screw machines and turret lathes which permits threading close to shoulders is being introduced by the Reed Rolled Thread Die Co., 237 Chandler St., Worcester 2, Mass. Since rolling can be done on the collet end of a part behind shoulders with this Series G2A attachment, a secondary operation is often eliminated.

This multi-purpose attachment is of the geared type, and is now being built in three standard sizes—1/2, 3/4, and 1 inch. Special sizes are available for larger threads.

These attachments incorporate simple means for readily changing the thread rolls and adjusting them for size. A precision matching device permits the rolls to be accurately matched by rotating one roll in relation to the other in infinite increments of circular measurements.

The head pivots in the adapter, allowing the rolls to automatically position themselves in relation to the center line of the spindle on contact with the work. Clearance between the shank of the head and the adapter allows the head to float sidewise, thus easing the side pressure on the rolls as they



Thread rolling attachment for screw machines and turret lathes made by Reed Rolled Thread Die Co.

are fed into the work. Upon completion of rolling, the head returns to the centralized axial position in the adapter.

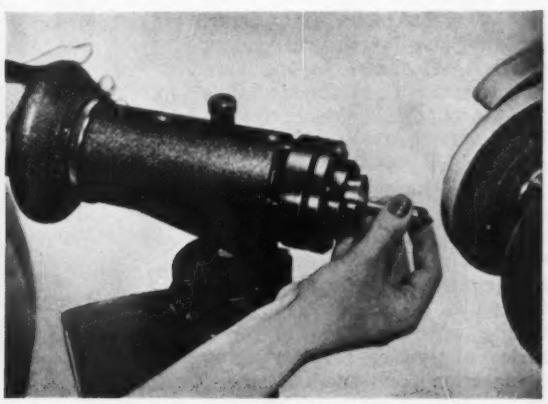
Cutter Grinding Fixture

A cutter grinding fixture developed to handle a wide variety of work, including sharpening countersinks of all types, center drills, integral pilot cutters, and right- or left-hand pilot drills, has been announced by the Industrial Grinding Co., 1600 W. Magnolia Blvd., Burbank, Calif.

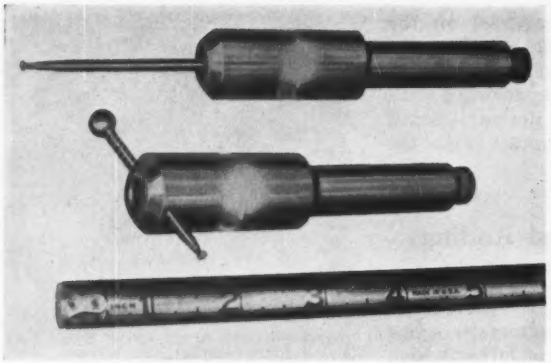
This relief type grinding fixture permits rapid, accurate functioning, and does not require a highly skilled operator. It can be easily adjusted for the correct relief and angle in relation to the grinding wheel, and will fit any standard grinder. Work from 1/16 to 1 inch in diameter can be handled with standard collets. The lift of the single cam is variable from 0.001 inch to 1/8 inch, and adjustment pins are provided for grinding cutters with one, two, three, four, and six flutes.



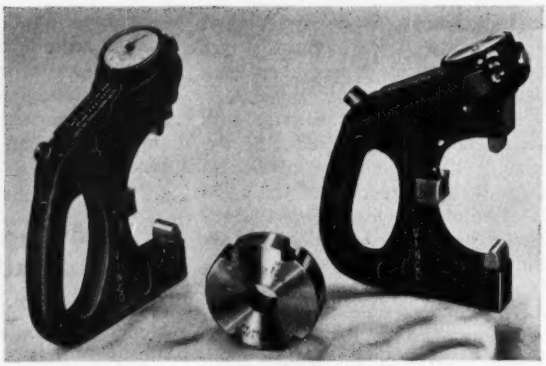
Electrical indicating dynamometer manufactured by W. C. Dillon & Co., Inc.



Versatile cutter grinding fixture brought out by Industrial Grinding Co.



"Light wigglers" or center finders brought out by Art-Mil Machine & Mfg., Inc.



Indicator snap gage for checking splined shafts developed by the Vinco Corporation

Battery-Operated Center Finder

Battery-operated center finders that light up when the point desired is located are being manufactured by Art-Mil Machine & Mfg., Inc., 170 Hosack St., Columbus 7, Ohio. These finders or "light wigglers" are designed for use with milling machines, lathes, jig borers, and drill presses where precision work is essential. They are accurate to within 0.0001 inch when used to locate working points or for slot and hole centering. The light operates on a standard one-cell battery similar to those used in flashlights attached to key chains.

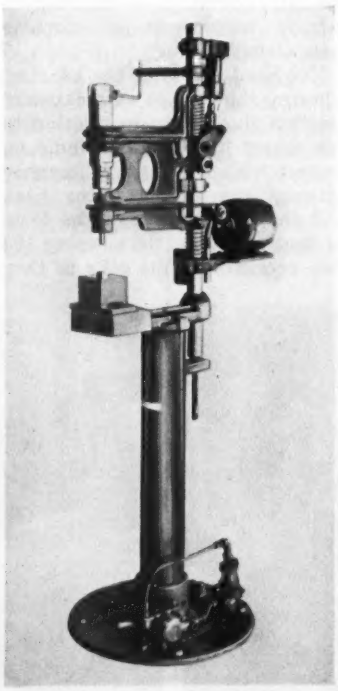
"Airflex" Pneumatic Riveter

The Lemert Engineering Co., Plymouth, Ind., announces the addition of an improved model to its line of "Airflex" pneumatic riveters. A new spindle minimizes impact noise, and a rotating hammer regulates blows as to force, rapidity, and duration, depending on the job. These features are said to make the riveter desirable for use on precision jobs involving fragile materials or slender, unsupported rivets.

The riveters are semi-automatic in operation, and are equipped with an air timing valve. The riveter goes through an operating cycle in response to the touch of a foot-pedal. The timing valve may be set for a series of impact blows ranging in duration from one-half second to any designated length of time. This timing feature cuts operator fatigue to a minimum.

The force of the blow and the hammering speed may be regulated independently of each other. Ranges are 5 to 80 pounds per square inch, and from 6000 to 16,000 strokes per minute. The hammer impact is controlled by altering the air pressure and by lengthening or shortening the gap between the piston head and peening spindle.

Floor and bench styles are available for general riveting and a double-end riveter for simultaneous heading of both ends of a rivet.



Improved "Airflex" pneumatic riveter made by the Lemert Engineering Co.

Vinco Indicator Snap Gages

An indicator snap gage for checking splined shafts has been developed by the Vinco Corporation, 9111 Schaefer Highway, Detroit 28, Mich. This gage has either a straight-sided rack tooth or a cylindrical section representing a measuring wire on the bottom and the top jaws. The top jaw is movable and actuates the dial cushion movement indicator, which is calibrated in increments of 0.0001 inch. A thumb-operated button lifts the upper jaw, permitting the indicator snap gage to be placed over the splined shaft in the correct position for the inspection operation.

The gage checks only the actual (dimensional) tooth thickness, at or near the pitch diameter. Variations in tooth thickness are read on the dial indicator. These indicator snap gages are set to masters, and afford a fast and comprehensive method of inspecting and controlling the sizes of splined shafts. The size range of these gages is from zero up to and including 8 inches.

Carbide Turning and Facing Tool

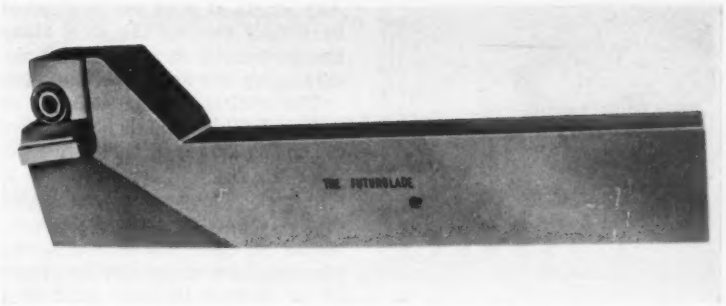
A lathe tool with eight cutting edges, called the "Futurblade," is being offered by the Detroit Milling Cutter Co., 28625 Grand River Ave., Farmington, Mich. It can be indexed in its holder to bring a sharp cutting edge into the working position when the edge in use has become dull. The solid carbide blades used in this tool are interchangeable with those

employed in the company's milling cutters.

Exceptional rigidity is an outstanding feature claimed for this tool. Practically the entire seating area of the solid carbide cutting blade is supported by the shank. Both the blank and the seat on which it rests are superfinished to gage block flatness to prevent the carbide blade from flexing or bending under strain.

The carbide blade is 7/8 inch square by 3/16 inch thick. When dull, it can be sent to the company to be reground at a low cost. The separate 3/4 inch square by 3/16 inch thick chip-breaker positioned on top of the cutting blade has extremely long life, being made of an abrasive resistant grade of carbide.

The same tool-holder can be used for either turning or facing by merely turning the chip-breaker from the side to the front position. Reground blades can be adjusted, and the chip-breaker can be changed from the parallel to the angular position. The end cutting edge or side cutting edge angles can also be changed. Clearance is provided for the cutting edges by positioning the blade in the holder with double negative-rake angles. For turning and facing into a 90-degree shoulder, a parallelogram type blade is furnished which gives additional clearances. Modifications of the basic blade design are possible to adapt it for use on tracer lathes employed for shell turning.



Lathe turning and facing tool brought out by the Detroit Milling Cutter Co.

Barker Improved Tool-Room Bench Type Miller

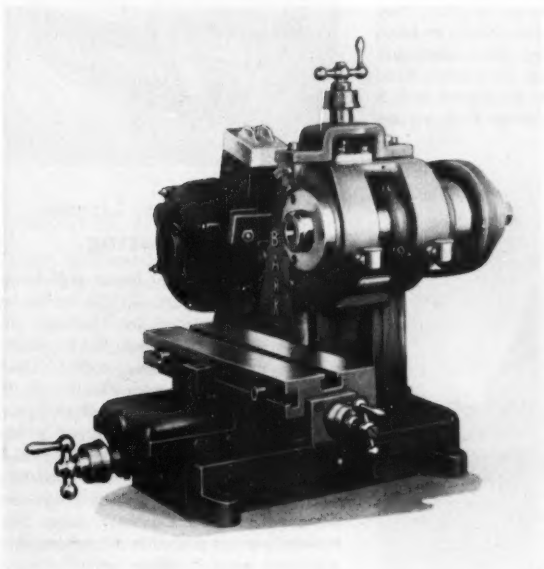
An improved tool-room model bench type miller has been announced by the Barker Engineering Co., 500 Green Road, Cleveland 21, Ohio. Micrometer feed-screws and an exclusive three-way travel feature are outstanding advantages claimed for this machine. The head travel is 3 1/4 inches, table travel 5 inches, and saddle travel 3 inches. The table is 4 by 12 inches.

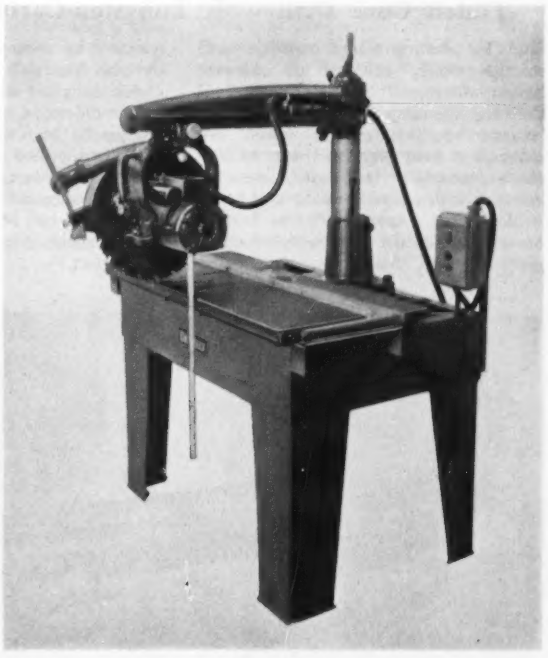
This machine is intended for handling small-run precision jobs. It is easily set up and changed over for work on different tools and special fixtures. It is designed to hold work to very close tolerances. High spindle speeds make it well adapted for use with carbide cutters.

DeWalt Power Cut-Off Machine

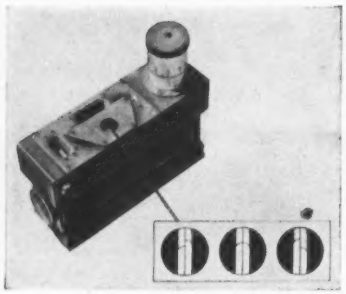
DeWalt, Inc., Lancaster, Pa., a subsidiary of the American Machine & Foundry Co., is building a 5-H.P. Model GRR radial arm cut-off machine with a 16-inch saw blade, which increases the depth of cut on this size machine from 4 1/2 to 5 1/2 inches.

(Below) Improved bench type tool-room miller recently placed on the market by the Barker Engineering Co.





DeWalt power cut-off machine of increased capacity



Precision measuring optical level made by F. T. Griswold Mfg. Co.

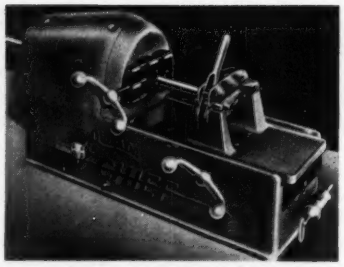
Optical Level for Precision Measuring of Straightness, Flatness, and Parallelism

An optical level for measuring flatness, straightness, and parallelism which is designed to permit reading deviations from the horizontal plane of 0.00012 inch per foot of length, or 0.00001 inch per inch of length, has been brought out by the F. T. Griswold Mfg. Co., W. Lancaster Ave., Wayne, Pa. This instrument makes it possible to check the flatness of surface plates and machine tool beds, the straightness of cylindrical rolls, and the parallelism of V-ways or flats to values well within the closest working tolerances. Any length of work can be checked by simply moving the level along the surface 7 inches at a time, this being the length of the level.

The optical system consists of three bubble phials and two prisms so arranged that twice the usual accuracy of level reading is obtained. The amount and value of deviation from the true horizontal in the work-piece being examined are measured by means of a large-diameter, graduated micrometer thimble and barrel.

Portable Pipe, Bolt, and Conduit Threading Machine

A new portable pipe, bolt, and conduit threader that weighs only 160 pounds is announced by the Quijada Tool Division of Gaines-Collins, 5474 Alhambra Ave., Los Angeles 32, Calif. This threader, called the Quijada "Chief," has a patented power-operated chuck which eliminates the use of wrenches or other manual tools in handling the pipe. A flip of the switch causes four jaws, front and rear, to automatically grip and center the pipe. Finger-tip control enables the operator to use the threader for making up, as well as threading, cutting, and reaming.



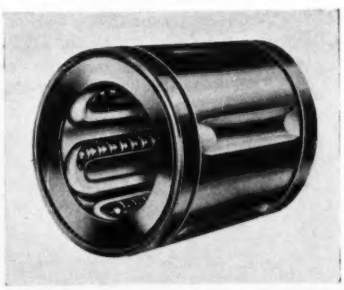
Quijada "Chief" portable threading machine

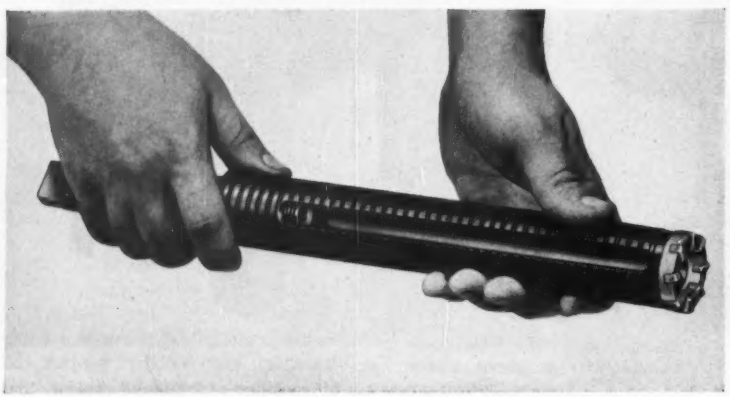
The threader has a pipe or conduit range of 3/8 to 2 inches and a bolt range of 3/8 to 1 1/4 inches. It is Alemite lubricated, and has a telescopic oil shaft which eliminates outside hose lines. Other special features include quick-opening die-heads; a cutter which is removable for short nipples, and is mounted on a front jaw housing; and a flat blade reamer which automatically reams while threading progresses. For bolt threading, the reamer can be removed. All bronze spindle (chuck) bearings are pressure lubricated.

Equipment includes 115-volt alternating- or direct-current motor; Alemite grease gun; pull-out type of chip pan; and six different die-heads.

Tilden Core Drill with Tungsten-Carbide Cutters

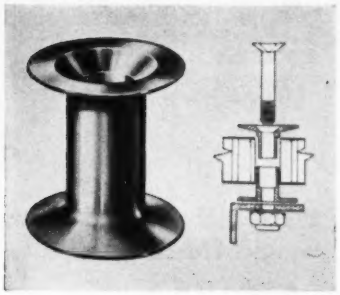
Tool for drilling cored castings and through holes, as well as counterboring, developed by the Tilden Tool Co., San Clemente, Calif. It has eight tungsten carbide cutters which are claimed to hold precision holes to size for exceptionally long runs, even in castings with excessive sand and hard-chilled surface spots. Another feature of the drill is the ease with which it drills through holes, the core being removed by means of a patented core slot in the side of the drill body. These drills are made in sizes of from 3/4 inch to 4 inches in diameter, and up to 36 inches in length. They can be supplied either with a plain pilot for counterboring or a twist drill pilot for step drilling. A coolant feed attachment has been developed and is now available for use on drill presses and lathes.





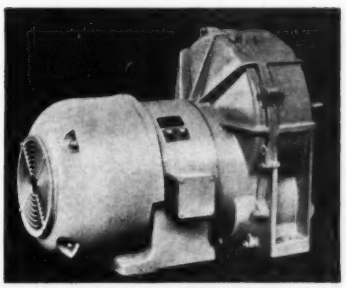
Heavy-Duty Linear Ball Bearing

Large-size heavy-duty linear ball bearing for use on shafts 2 1/2 inches in diameter, announced by Thomson Industries, Inc., Manhasset, N. Y. Heretofore, these bearings, called "ball bushings," have been available only in smaller sizes which were not designed for heavy load applications or where extreme rigidity requirements necessitate the use of heavy supporting shafts. The heavy-duty bearings are designed to give extremely long life, maintain exact precision alignment, and eliminate wear, binding, and chatter.



"Fasco Spacer" for Use in Fastening Sandwich Type Structures

Strong, lightweight bolt type spacer designed to solve critical fastening problems where crushing of sandwich type structures must be avoided. Other important applications include fastening of soft woods, and any fragile structures where the take-up of nut and bolt must be limited to a specified grip length. The "Fasco Spacer," as this fastening device is called, provides a means of attaching conduits, cables, instruments, and other equipment to sandwich type structural panels. It is designed with an interference fit of from 0.002 to 0.005 inch, which assures firm mating of parts and positive aligned grip. The material is 24S-T aluminum alloy anodized in specified colors. It is available in Nos. 8 and 10, and 1/4 inch sizes, with grip lengths ranging from 3/16 to 1 inch. Product of the Delron Co., Inc., 5524 Southern Ave., South Gate, Calif.



Geared Electric Drive

Totally enclosed fan-cooled geared motor for heavy-duty applications, recently added to the line of "Slo-Speed" electric power drives manufactured by Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif. This new unit is built in a double-reduction type and is available with Class I, II, and III gears in frame size 364/365, AGMA speed rating of 155 R.P.M., and in slower ratings from 5 to 25 H.P. These geared motors are well suited for low-speed drives where maximum protection is required against non-explosive liquids, dust, or vapors.

Small Toggle Switch

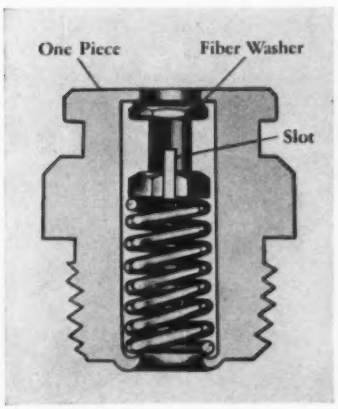
One of a series of extremely small toggle switches designed primarily for use in assemblies where precise switching components must be located in unusually small spaces, announced by the Micro Switch Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. The switches in this new line were designed for aircraft use, but they also have other applications. Available in single-pole double-throw, and double-pole



double-throw service types. The alternating-current rating is 5 amperes 125 or 250 volts. The smallest of these switches assembled in its toggle actuator bracket is only 25/32 inch long, 23/64 inch high, and 1/4 inch wide.

One-Piece Grease Fitting

Universal giant size buttonhead grease fitting of novel one-piece construction for use on all heavy industrial machinery. This fitting is now being manufactured by Universal Lubricating Systems, Inc., 695 Allegheny Ave., Oakmont, Pa. It is built to provide maximum grease flow and to prevent the leaking of oil. A strong steel inner spring with a fiber sealing washer prevents grease leak-back. Available in all regular sizes.





Hannifin Pressure-Operated Four-Way Valve

Series BB four-way valve of new P-M line of "Pilot-Master" valves, just introduced by the Hannifin Corporation, 1110 S. Kilbourn Ave., Chicago 24, Ill. It consists primarily of two Series B three-way Pilot-Master valves in one compact body, with internal coring so arranged that one valve operates normally closed while the other operates normally open. The two valves shift simultaneously when pressure is introduced to the chamber over the two piston poppets, and pressure within the valve returns both piston poppets to their normal position when pilot pressure is released. With this novel arrangement no springs or levers are required. These valves are made in 3/8, 1/2, and 3/4 inch sizes.

Simplified Metal Spray Gun

Improved model of compact, simplified spray gun designed for the spraying of low-melting alloys and metals, introduced by the Foundry Accessories Sales Division, the Cooper Alloy Foundry Co., Hillside 5, N. J. This new gun, called the "Spray King," has in addition to the internal heating element a specially designed nozzle heating element which prevents the metal from cooling at the nozzle, and thus assures a continuous uniform spray. It is especially designed



for use in spraying those marginal alloys in the 500 to 650 degree F. range which are more difficult to apply. Suitable for intermittent or production spraying in precision casting, tool, and die shops.

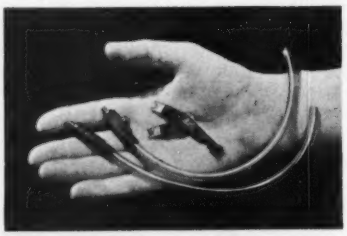
All-Purpose Hand Hacksaw Blade

"Rocket" high-speed hand hacksaw blade recently added to line manufactured by W. O. Barnes Co., Inc., Department B, 1297 Terminal Ave., Detroit 14, Mich. This product provides an all-purpose blade combining proper hardness, cutting ability, flexibility, and safety. Only the teeth of the blade are hardened, the back being semi-hardened for flexibility.



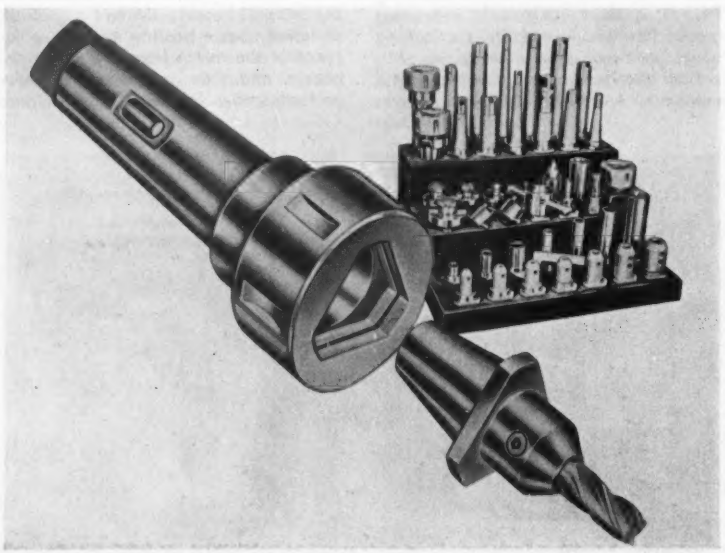
"Plunjet" Gaging Head for Use with Precisionaire

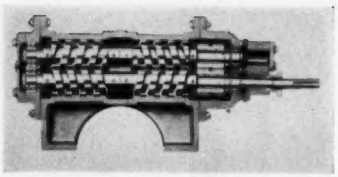
Revolutionary new type of gaging head known as the "Plunjet" developed by the Sheffield Corporation, Dayton 1, Ohio, for use in conjunction with the Precisionaire and other makes of air gages for gaging wide tolerance work. It can be adapted for many gaging applications, the gaging head being calibrated by a feeler gage having minimum and maximum limit elements. Two types are available, the normal and the reverse, and they may be had in three standard ranges—0.040, 0.020, and 0.010 inch. "Plunjets" for special ranges and closer tolerances can be supplied on special order. This gage is especially adapted for use in measuring profiles of turbine blades and buckets.



Quick-Change Tool-Holder and Adapter Set

Triple-lock "P. D. Q." tool-holder with a locking feature that permits fast tool changes and accurate repositioning, made by Portage Tool Co., 1036 Sweitzer Ave., Akron, Ohio. Three-point holding design of the taper shank eliminates run-out on precision work. The fifty-seven-piece tool set includes holders for boring, milling, and lathe applications. Boring mill holders have Nos. 4, 5, and 6 Morse tapers and milling machine holders, Nos. 40 and 50 tapers. Turret lathe adapters are designed to fit any turret lathe. End-mill adapters range in size from 3/8 inch up to 1 1/4 inches. Boring-bar holder has straight or 30-degree angle bit and is made in lengths of 3, 6, 9, and 12 inches. The boring head has accurate micrometer adjustment. Also included in the set are adapters for shell mills, end-mills, drill chucks, and boring heads.





Sier-Bath Internal Gear and Bearing Type Screw Pump

Internal gear and bearing type screw pump designed for positive displacement of lubricating fluids or semi-fluids, announced by the Sier-Bath Gear & Pump Co., Inc., 9252 Hudson Blvd., North Bergen, N. J. Capacities range from 1 gallon to 700 gallons per minute. Maximum discharge pressures are 1000 pounds per square inch for viscous liquids, and 500 pounds per square inch for light oils. The pump is adapted for direct motor drive.

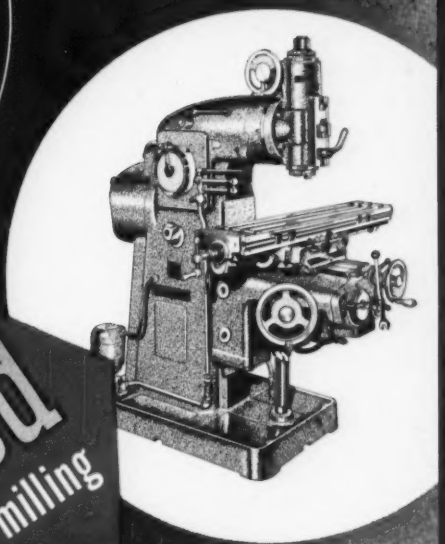


Adjustable Prop or Support for Loads up to 10 Tons

Adjustable support for propping open a press or die set or supporting a hold-down clamp. This "Saf-T-Prop" consists of a cylindrical ram filled with flat steel slugs. When the ram is lifted, the slugs pour out of an opening and fall into the outer cylinder to form a solid mass of steel on which the ram rests. The ram will support a load of 10 tons, and can be returned to its original position by turning the unit upside down. It is made up in standard sizes having heights of 2 1/2, 3 5/8, 5 3/8, and 8 inches. When fully extended, these props have maximum heights of 3 5/8, 5 3/8, 8, and 12 inches, respectively. The cylinders are of welded steel construction, and are manufactured by Lempco Products, Inc., Bedford, Ohio.

(This section continued on page 235)

B·S



Productioneered

equipment for all-round production milling

Today especially — when sudden switchovers from civilian to military production are common — the characteristic flexibility of Brown & Sharpe Machines and Tools is invaluable to milling departments. These products are "Productioneered" for emergency as well as normal production . . . specifically engineered for high output with uniform accuracy on a wide variety of small-to-medium-size parts.

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for versatile vertical and end milling

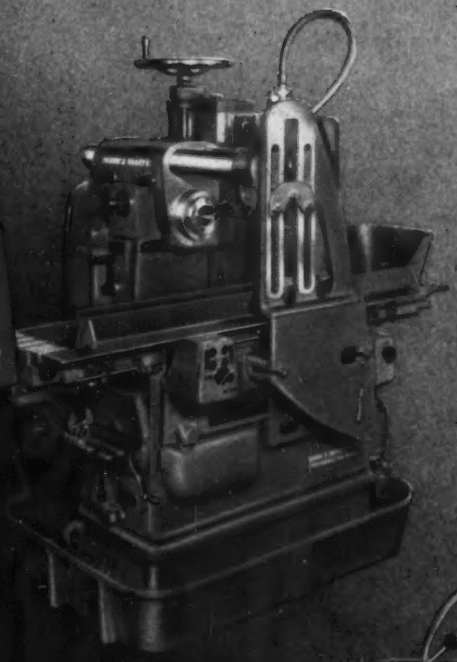


No. 2 VERTICAL MILLING MACHINES
3 and 5 H.P.

Designed with a versatile swiveling spindle head, and many of the flexible features of plain and universal machines. Choice of full 3 or 5 h.p. drive to cutters . . . speed ranges 50-1800 or 40-1530 R.P.M. Swiveling head, with hand or power feed, cuts costs on end and face milling, die- and mold-making.

Brown & Sharpe

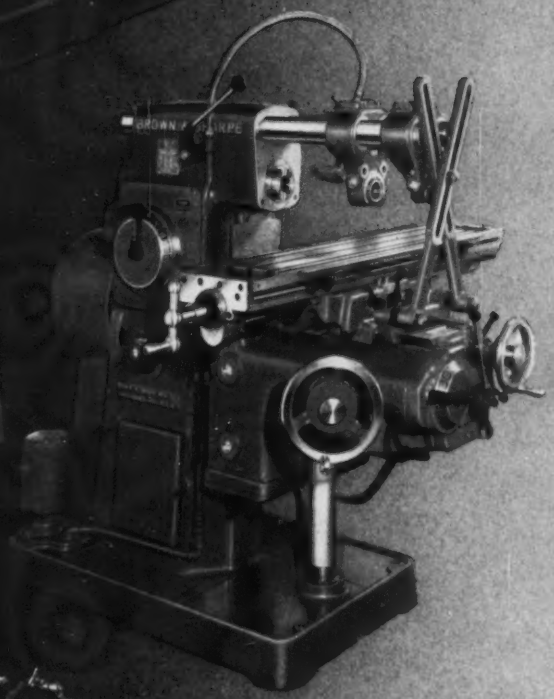
Productioneered for long and short runs, high precision



No. 12 PLAIN MILLING MACHINES
3 and 7½ H.P. Spindle Drive

Here are excellent electrically controlled manufacturing-type machines for mass-producing small-to-medium size parts, accurately, at low cost. Speeds: 25 to 1050 and 25 to 1790 R.P.M. The 7½ h.p. model handles many moderate-sized carbide milling jobs.

Productioneered for more flexible set-up and operation



Productioneered for high-level production of small parts



No. 2 PLAIN MILLING MACHINES
3 and 5 H.P.

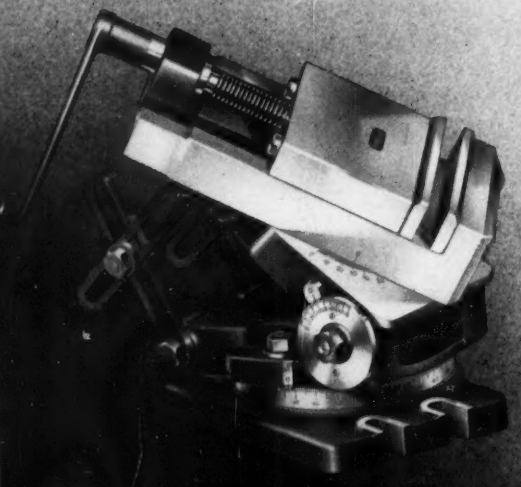
Unusual handling flexibility is provided in these machines by special features . . . tri-motor drive, column-and-knee type design, ample feed and speed rates, extended spindle face for rigid cutter support. Full 3 or 5 h.p. drive to cutters.

No. 000 PLAIN MILLING MACHINE

Designed for highly efficient production of small parts in assemblies such as sewing machines, radios and firearms. Simple to set up, fast in operation, exceedingly accurate. Automatic operating cycle. Broad ranges of speeds and feeds.

Productioneered

to aid in efficient, accurate output



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Provide easy, secure holding for milling, drilling and grinding. Wide range of styles and sizes: Toolmakers' (illustrated), has vise proper adjustable to any angle . . . Cam type, for fast handling of duplicate pieces . . . Swivel . . . Flanged . . . and Plain styles.



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The surest way to maintain uniform precision throughout production is to inaugurate regular checking of your measurement standards in every department with accurate Johansson Gage Blocks. It will cut lost time and spoilage. 3 guaranteed accuracy standards: .000002", .000004" and .000008" per inch.

CUTTERS

The clean-cutting, long-wearing [illegible] of these cutters help to maintain [illegible] output at highest volume levels. The complete line of Brown & Sharpe Cutters includes outstandingly productive styles for every type of milling job.



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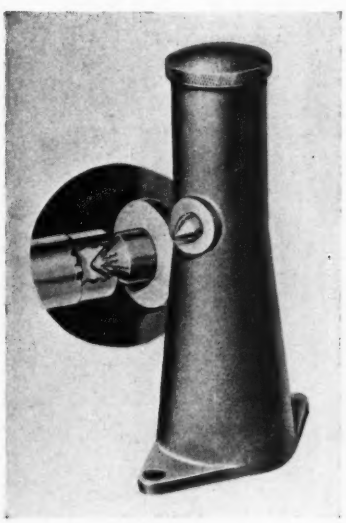


"Tygon" Flexible Plastic Tubing with Braided Stainless-Steel Reinforcement

"Tygon" flexible plastic tubing with a triple-wire, stainless-steel outer braid, made available by the U. S. Stoneware Co., Akron, Ohio. This tubing was developed to meet the demand for a chemically resistant, translucent, nontoxic, flexible tubing and hose for high-pressure applications. The novel construction of this tubing enables it to absorb vibration more readily, and it does not crack, leak, or break under working pressures up to and including 300 pounds per square inch. It has the added advantage of being translucent, thus permitting visual inspection of fluid flow and simplifying cleaning. Furnished in two sizes, having inside diameters of 1/4 and 3/8 inch. It is available in running or fitted lengths. All fittings are stainless steel.

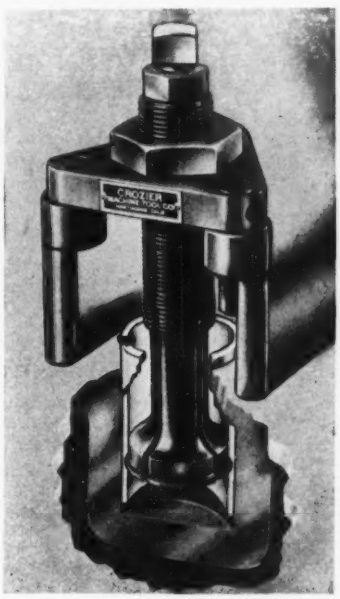
"Center Lobe Dispenser" Attachment for Lubricating Lathe and Grinder Centers

A sealed oiling device for lathe and grinder centers called the "Center Lobe Dispenser," which can be mounted on work-bench or machine as a permanent attachment, has been announced by the H. K. Tool Co., Waukesha, Wis. This device is designed to make possible the quick, clean lubrication of centers and thus eliminate the necessity for using an ordinary oil can or white lead. Simply pressing the work against the center of the dispenser causes clean oil to be ejected into the center in the work and prevents foreign material, chips, or borings from entering.



Bushing and Bearing Extractor

Bushing and bearing extractor for blind holes, recently introduced on the market by Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Calif. This



product is designed to save time in extracting bushings, bearings, sleeves, liners, roller bearing cups, races of magnet type bearings, and similar objects. The extractor minimizes the hazard of injuring casings or excessive dismantling of equipment. It consists of eight threaded expanding arbors, a draw table with two sets of legs, short and long, adjustable as to distance from the work, and can be used for any size hole from 1/2 inch to 2 inches in diameter. A maximum of 2 1/2 inches may be drawn at one setting. Parts assembled with press fits of over five tons have been extracted readily with this unit.

Cork Surface Polishing Belt

Coated abrasive polishing belt that uses granulated cork rather than conventional mineral grains for obtaining a high luster finish on glass, ceramic,



metal, and plastic materials. This product of the Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn., is called the 3M "Wetordry" brand polishing belt. It is designed primarily as a glass edge-polishing tool, although it is expected to find applications in other fields. The cork surface of the belt is sized with resin combined with a polishing agent that is said to improve the polishing action. A waterproof cloth backing is used, to which the cork granules are resin-bonded. Water is recommended as a lubricant in glass grinding operations, and oil or grease with metal. The belt is used with the regular abrasive grit sequences in the grinding and polishing processes, and is available in a single universal surface in standard sizes for existing abrasive belt grinding and polishing equipment.

Electrically Lighted Magnifier

Electrically lighted magnifier for use in examining all kinds of materials and for inspecting machine parts. This instrument magnifies the inspected object to five times its actual size under a flood of direct light from a 110-volt illuminator-equipped handle. Shown in the foreground are an alternative battery-powered illuminator handle and



two accessories — a non-illuminating handle and a metal tripod. Product of Bausch & Lomb Optical Co., 213 Cutler Bldg., Rochester, N. Y.



Portable Demagnetizer

Portable "Miti-Mite" demagnetizer announced by Enco Mfg. Co., 4520 W. Fullerton Ave., Chicago 39, Ill. This instrument can be operated by 110-volt alternating current, and is said to thoroughly demagnetize tools, dies, parts, pieces, etc., by merely pressing the switch-button and sliding it over the surface to be demagnetized.

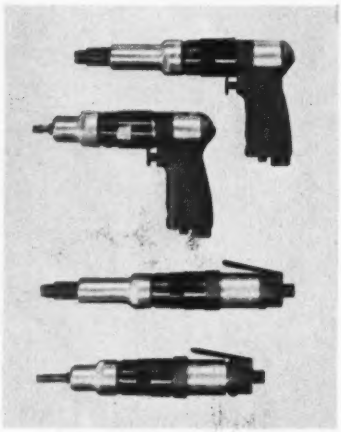
Heat-Treating Furnace with Wide Temperature Range

Pereco heat-treating furnace recently added to the improved line of general-purpose electric furnaces manufactured by the Pereny Equipment Co., 893 Chambers Road, Columbus, Ohio. It is equipped with Globar elements and is designed for continuous efficient operation at all heat levels up to 2500 degrees F., with even higher temperatures available for short or intermittent runs. The manually operated door is also available for air operation. A gas curtain attachment and valve are provided as standard equipment. The furnace operates on a 220-volt, three-phase, 60-cycle circuit with maximum power requirement of 15 kilowatts. The chamber is 8 inches wide by 16 inches deep by 6 inches high.



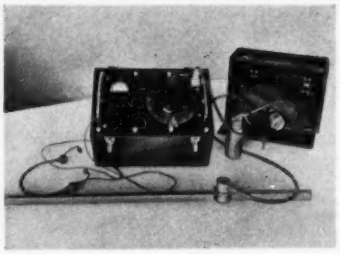
Midget-Size Air-Driven Screwdrivers and Nutsetters

Series of midget-size air-driven screwdrivers and nutsetters recently added to the line of portable air tools manufactured by the Master Pneumatic Tool Co., Inc., 2100 Keith Bldg., Cleveland 15, Ohio. These tools are designed for driving nuts, bolts, and screws in all types of assembly and sub-assembly operations. Their rated capacity is for driving screws up to size No. 12, and for nuts and bolts up to 1/4 inch in diameter. Three types of clutch mechanisms are adaptable to three different free speeds of 580, 1200, and 2400 R.P.M. The tools can be fitted with either pistol or lever type throttle handles, and have spindle adapters for both screwdriver bits and nut-socket adapters, providing a total of thirty-six models. Tool weights range from 1 13/16 to 2 1/2 pounds. The tools operate at air pressures of from 80 to 100 pounds per square inch.



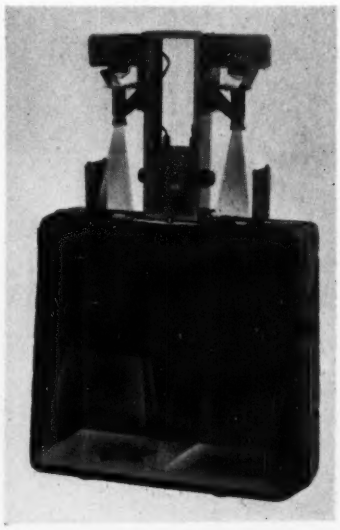
High-Precision Ultrasonic Micrometer

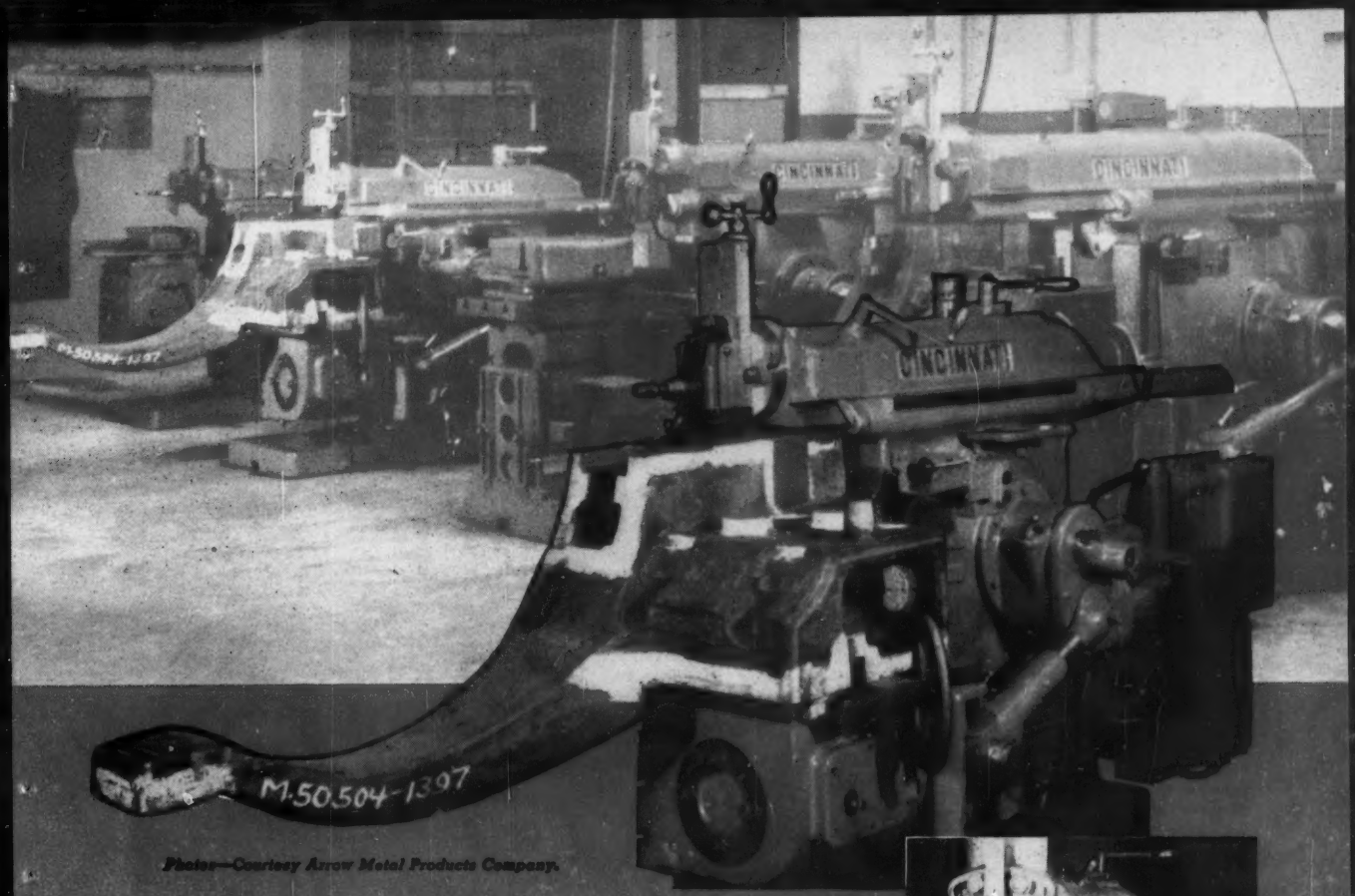
"Audigage" ultrasonic micrometer developed by Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn., for making precise ultrasonic thickness measurements. Measurements consistently within 1/2 of 1 per cent of actual thickness have been obtained from one side of materials with smooth surfaces. The "Audigage" can be used on homogeneous materials such as steel, brass, aluminum, copper, glass, Lucite, and other dense substances capable of transmitting the ultrasonic waves generated by a vibrating crystal. Since accuracy rather than rough checking is the primary objective of this micrometer, it is designed to operate with high precision over an infinite series of relatively narrow thickness ranges between 0.010 inch and 12 inches. The "Audigage" complete with accessories weighs only 23 pounds. Operates on 90-115 volts.



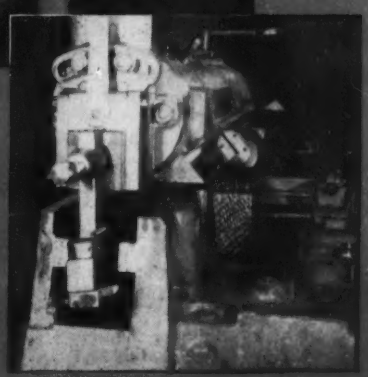
"Faxfilm" Surface Comparator

Surface comparator introduced by the Brush Development Co., Instrument Division, 42G, 3405 Perkins Ave., Cleveland 14, Ohio. With the "Faxfilm" method of determining the quality of surface finish, a clear plastic replica of the surface (which can be made in about a minute) is projected in a microprojector to show minute details of surface condition with marked three-dimensional effect. The new portable comparator illustrated provides a convenient means for projecting two Faxfilm replicas at a magnification of 30 diameters. Its principal uses include comparison of work specimens with standard finishes in surface roughness inspection, of finishes obtained in machinability studies, and wear tests.





Photos—Courtesy Arrow Metal Products Company.



An unusual undercutting operation

small investment— BIG JOB

Cincinnati Shapers can be profit builders for you. Write for Catalog N-5 for full information.

These large sidearms for stamping presses are machined on Cincinnati Shapers very profitably and efficiently, for two reasons—low investment and accurate, speedy performance.

This battery of rigid, powerful Cincinnati Shapers at Arrow Metal Products Co. is equipped with the Electro - Magnetic Clutch for speed and dependable operation. Modern controls are conveniently located for the operator, and also contribute to efficiency.

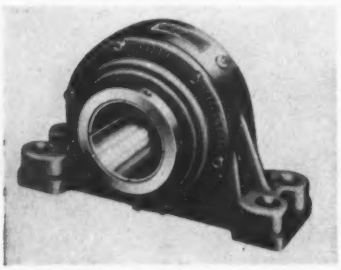
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

Dodge-Timken All-Steel Pillow Blocks

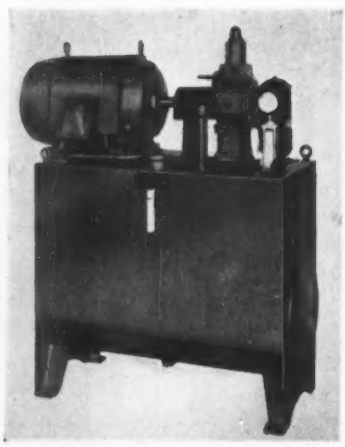
One of a line of all-steel pillow blocks, providing high load-carrying capacity in a compact, rugged design, just introduced by the Dodge Mfg. Corporation, Mishawaka, Ind., and the Timken Roller Bearing Co., Canton 6, Ohio, which is the result of pooling the engineering resources and bearing building experience of both companies. High



radial and thrust capacities and the stamina to take heavy shock loads are features of the new bearings. They are fully self-aligning, with spherical outer race, are available in both expansion and non-expansion types, and have adapter mountings. The bearings are sealed both on and off the shaft and will be provided in shaft sizes from 2 15/16 to 10 inches.

Hydraulic Power Unit with Special Equipment

Power unit manufactured by Superdraulic Corporation, 14256 Wyoming Ave., Detroit 4, Mich., in 30-, 60-, and 80-gallon sizes. These units are assembled with Superdraulic or any other make of pump. In addition to pump, motor, valves, etc., the unit includes sight gages, filler and bleeder caps, and oil filters. The units can be furnished with special types of equipment to suit individual requirements.





Dresser for Coated Abrasive Belt

Faster stock removal, longer belt life, and up to 75 per cent increase in total stock removal during belt life are the advantages claimed for this new "Beltbrasive" dresser, just announced by the Desmond-Stephan Mfg. Co., Urbana, Ohio. When contacting abrasive belts in motion, the dresser cutters remove glazing and loading from the belt and expose sharp abrasive particles.

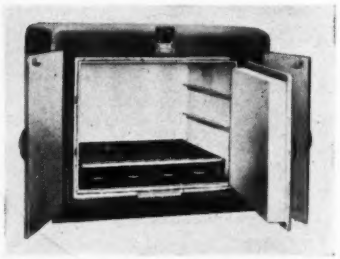


Portable Coolant System

Simplified coolant pump and motor assembly, which, when immersed in a pail or other container of coolant, becomes a complete coolant system. This low-cost system has recently been introduced by Factory Tools, Inc., 4706 W. Arthington, Chicago 44, Ill. The built-in high-volume vane type pump, driven by a fully sea'ed 1/30-H.P. motor, delivers a steady stream of coolant or oil through a semi-rigid flexible metal hose 4 feet long. The nozzle on the hose permits the coolant flow to be adjusted from a trickle to full volume. Supplied with a 6-foot electric cord.

Portable Oven with Inconel Tubular Heater

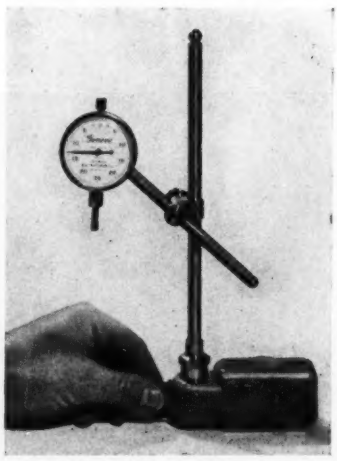
Portable electric oven for high-temperature processing equipped with Inconel sheathed sealed tubular heating element designed for greater heating efficiency. This heater has a wide range of applications, including baking, drying, preheating, and stress relieving of springs and plated parts. A thermostat controls the temperature within a range of 300 to 1000 degrees F. Two or more of these ovens can be used in a group or bank. They have stainless-steel interiors and are constructed of heavy gage steel with a minimum of 4 inches of Fiberglas insulation. Double doors are provided for sealing in the heat. Inside dimensions are 22



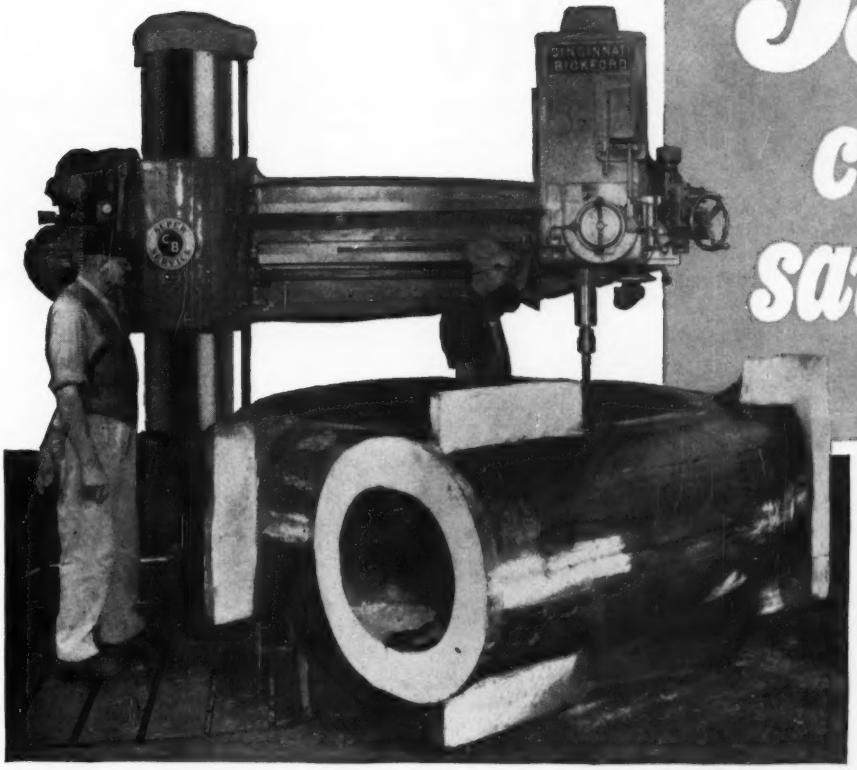
inches wide by 18 inches deep by 16 inches high. Operates on 220-volt, single-phase current. Product of Grieve-Hendry Co., Inc., 1101 N. Paulina St., Chicago 22, Ill.

Geneva Dial Indicator Test Set with Magnetic Base

Geneva magnetic base test set designed to facilitate precision checking operations performed by toolmakers, set-up men, inspectors, and machinists. A strong, 100-pound pull Alnico permanent magnet in the base permits the test set to be positioned quickly on flat or curved surfaces. A flick of the finger releases the magnet, and the set can be removed or positioned without jarring the indicator. Three models of this test set are available. Each includes the Geneva magnetic base, a holding rod, and a dial indicator. The magnetic base is 1 1/4 by 3 inches, and can be pur-



This BICKFORD effected a 35% cost saving!

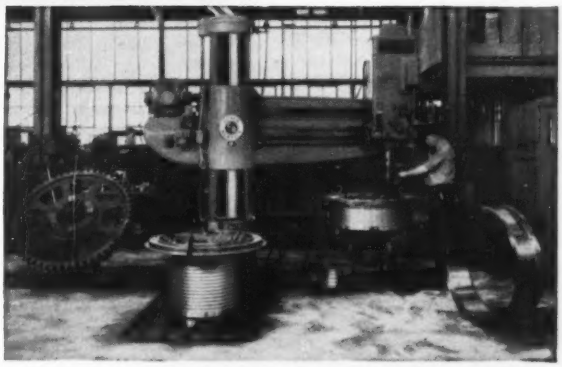


Drilling large centrifical dredge pump housing. This 7 arm, 19" diameter column Cincinnati Bickford Super Service, equipped with triple base, allows setup of two jobs while the third is in process.

The efficient drilling department at the National Supply Company of California effected a 35% cost reduction in drilling operations with this Cincinnati Bickford Super Service Radial Drill.

Here the many feeds and speeds of the Cincinnati Bickford Super Service Radial Drills—and their rigid construction—combined with their easy operation—handle a variety of heavy duty jobs with outstanding dependability at low costs.

Write for Booklet R-29 on these powerful, accurate Cincinnati Bickford Super Service Radial Drills.



Drilling and tapping a clutch housing. Note the second housing ready for drilling on one of the triple bases of the machine. No time lost in setup.

Photos—Courtesy of National Supply Co., Torrence, Calif.

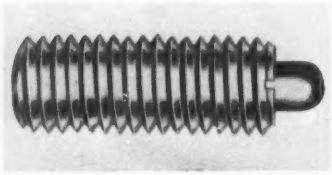
CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

chased separately. Placed on the market by the Chicago Dial Indicator Co., Department M, 180 N. Wacker Drive, Chicago, Ill.



Vlier "Silvertip" Spring Plunger

High-speed spring plunger of new "Silvertip" line with lighter spring pressures than standard plungers, developed specially for high-speed automatic punch presses and other machine tools by the Vlier Mfg. Co., 4552 Beverly Blvd., Los Angeles 4, Calif. These spring plungers are identified by a brightly finished cadmium-plated plunger end. The lighter springs are said to have a longer life and to be less subject to breakage under fast flexing. They also enable the operator to position and release work-pieces easier and faster without spring failure due to crystallization. The plungers range in length from 1/2 inch to 2 1/4 inches, with spring pressures from 1 pound to 6 pounds.

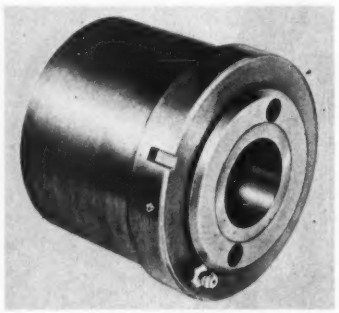
Automatic Acetylene-Air Gas Torch

Pistol-shaped "Torch-O-Matic" acetylene-air gas torch which lights automatically when the trigger is squeezed and shuts off when the trigger is released. This eliminates a separate lighting operation and the need for equipment ordinarily used for relighting. The torch is adapted for use in loosening frozen nuts and bolts, setting anchor bolts, removing shrink-fit collars and bushings, and rebabbitting bearings, in addition to many maintenance or production jobs requiring soldering or brazing. It weighs only 12 ounces, and provides a quick means of heating work up to a temperature of 2800 degrees F. Combustion tubes are available in 1/8, 3/16, and 1/4 inch sizes. Placed on the market by the Velocity Power Tool Co., 7505 Thomas Blvd., Pittsburgh 8, Pa.



Pilot Bearing Bushing Provides Seal Against Grit and Dust

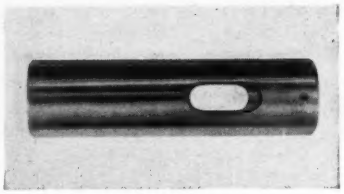
Pilot bearing bushing manufactured by the J. G. Jergens Co., 11106 Avon Ave., Cleveland 5, Ohio, is said to provide a complete, lifetime seal against



harmful grit and dust. The cartridge type bearing is designed to offer greater accuracy than bearings placed directly in machines or die fixtures and to give protection against thrust and radial loads. Greater bar support is provided due to the over-all length of the bushing. With these new bushings, tapered bearings can be adjusted to compensate for wear, and are adaptable to receive removable slip bushings as well as keys or keyways. Can also be employed to advantage for steadyrests and back-up rolls and internal centerless grinder pressure rolls.

Stub Taper Tool-Holder for Turret Lathes and Screw Machines

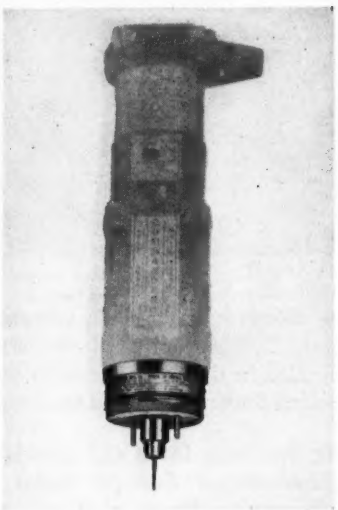
Sleeve type, stub taper turret tool-holder brought out by Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill., for holding counterbore cutters, countersinks, core drill cutters, and similar tools having standard stub taper shanks. It is designed to shorten the projection or overhang between turret and work, eliminate the need for conventional type holders, and assure a simple but rigid set-up. The holder is hardened to resist nicking and burring, and is ground on the outside to assure a good fit in the turret hole. The splined



section engages the tang on the shank of the cutter for a positive drive to eliminate slipping and cutter damage. Available for Nos. 2, 3, and 4 stub tapers.

Tapping Chuck with Finger-Tip Control

Tapping chuck which is said to give extremely sensitive and precise fingertip control of small taps used in high-volume production work. This device, recently introduced by the Commander Mfg. Co., 4225 W. Kinzie St., Chicago, Ill., is designed for use with the "Commander Tapper." In operation, the tapping head remains in a fixed position, actuation of the tap being controlled by the operator's finger tips.



Only one-eighth turn of the drive engaging collar is required to engage or disengage the tap from the driving mechanism.

* * *

Gearing Industry Reports Increase

According to the latest figures of the American Gear Manufacturers Association, the volume of business in the gearing industry increased by 6 per cent in June, compared with the previous month. The AGMA index figure for June was 452.3.

HARTMAN

The cutting edges of a DYMON-IZE* ground broach look like this, when enlarged 50 times.



Get this instead of this



Minute jagged edges are characteristic of conventionally ground broaches (same enlargement).

Specify DYMON-IZE* ground broaches and get

LONGER BROACH LIFE & SMOOTHER SURFACE FINISH

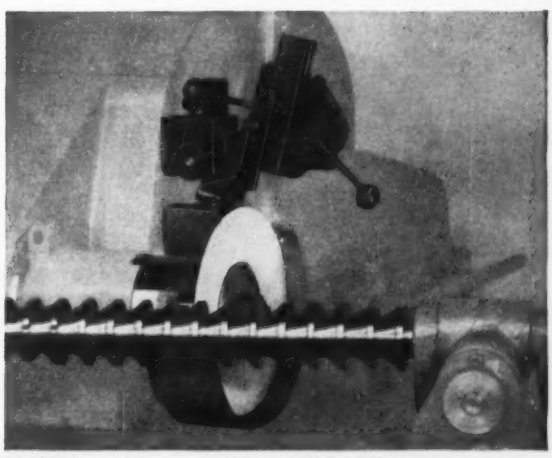
The smoother cutting edges and tooth rakes of DYMON-IZE* ground broaches mean longer broach life, smoother chip flow, and smoother surface finish on broached parts.

All Colonial internal broaches are now available DYMON-IZE* ground at no extra cost.

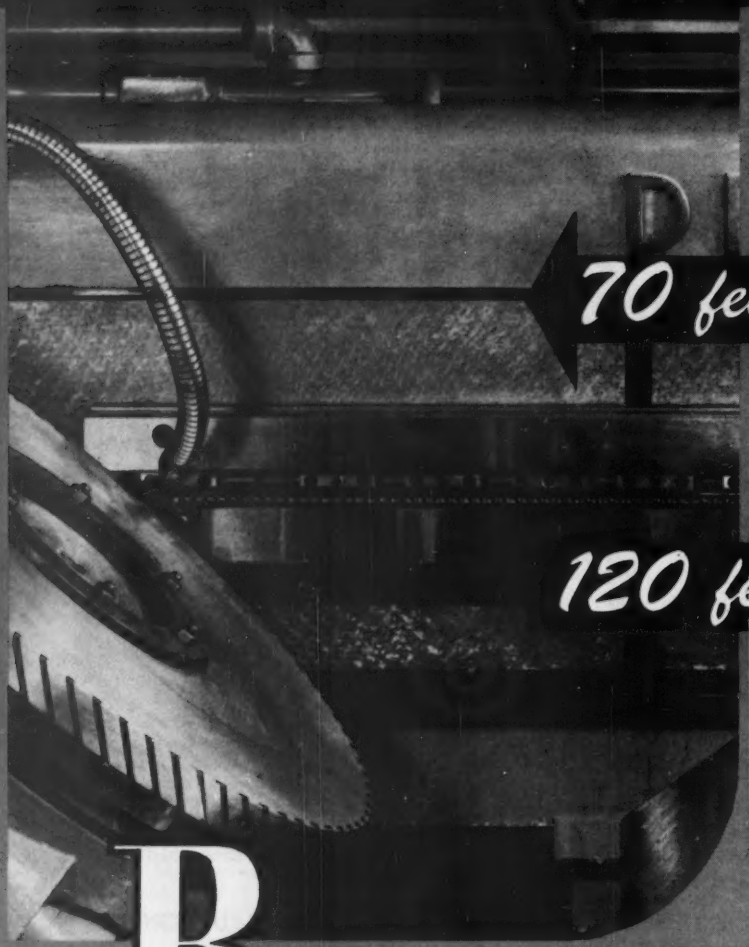
Specify "DYMON-IZE Ground" on your prints.

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

*Registered Trade Mark. Patents applied for.



DYMON-IZE units are also available for use on your broach grinders to insure that your broaches will give you the same peak performance after sharpening as when new. Ask for DYMON-IZE Bulletin #DS-52.*



Broaching compressor wheel slots

Broaching intricately formed slots in aluminum compressor wheels at a speed of 70 feet per minute — with a return stroke of 120 feet per minute — is a practical reality at Detroit Broach. This great broaching advancement is the result of imagination and sound broach-engineering experience . . . a combination forged by years of creative engineering and manufacturing of broaches and broaching tools exclusively.

Whether your application involves a new concept in broaching or the simplest type of conventional broaching, these same factors will benefit you in terms of broaching economy and dependable tooling when you call on Detroit Broach.

WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY



DETROIT BROACH COMPANY

20201 SHERWOOD AVE. • DETROIT 34, MICH.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the September, 1952, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

DIMENSIONING PRACTICE—Gisholt Machine Co., 1221 E. Washington Ave., Madison 10, Wis. Booklet entitled "Practical Dimensioning," explaining how proper dimensioning on drawings will save time and money in the shop. Can be obtained by writing direct to the company at the above address on a business letter-head.

PLIERS AND ADJUSTABLE WRENCHES — Educational Department, Utica Drop Forge & Tool Corporation, Utica 4, N. Y. Chart listing some 144 pliers and adjustable wrenches, and showing for quick comparison the brand names and tool numbers of thirty-one manufacturers. Can be obtained when requested on a business letter-head direct to the above address.

MOTOR DRIVES — Worthington Corporation, Harrison, N. J. Bulletin AS-1600-86, outlining features and advantages of the Worthington Allspeed motor drive from 1/3 to 7 1/2 H.P. Can be obtained if requested on a business letter-head direct to the corporation.

STAMPINGS—HPL Mfg. Co., 15191 Miles Ave., Cleveland 28, Ohio. Bulletin 718, entitled "Stampings in Small Lots," showing typical shapes produced by the company. Can be obtained if requested on a business letter-head.

ALLOY CASTINGS—International Nickel Co., Inc., New York City. 48-page catalogue entitled "Heat-Resistant and Corrosion-Resistant Alloy Castings in Industry." Preceded by a general discussion of heat- and corrosion-resistant alloy castings, over 175 photographs illustrate applications of typical alloys. 1

BONDING PROCESS—Al-Fin Division of Fairchild Engine & Airplane Corporation, Farmingdale, N. Y. Manual entitled "The Al-Fin Molecular Bonding Process," describing the Al-Fin process of casting aluminum and its alloys against an especially prepared surface of steel, iron, and other metals. 2

CIRCULAR SAWING MACHINES — Motch & Merryweather Machinery Co., Cleveland, Ohio. Bulletin 375 on the No. 3 circular sawing machine for solid rounds, squares, tubing, or structural shapes. Bulletin 475, on the No. 4 machine for cutting big stock. 3

MOLDED PLASTICS—Kuhn & Jacob Molding & Tool Co., Trenton, N. J. Booklet entitled "A Service to Users of Compression Molded Plastics," presenting a description of the company's services and facilities in the compression molding of thermosetting materials. 4

CARBIDE TOOLS—Kennametal Inc., Latrobe, Pa. Catalogue 52, consisting of 65 pages of descriptions of Kennametal carbide tools, blanks, etc. A section of technical data on properties, selection, and application of Kennametal products is included. 5

HACKSAW BLADES—DoAll Co., Des Plaines, Ill. Bulletin 50-823, describing the company's hacksaw blades for use on hacksaw machines and for hand hacksaw frames. A speed and feed chart for cutting different materials is given. 6

TOOL STEEL—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Bulletin descriptive of Ry-Die, an air-hardening tool and die steel of the 5 per cent chromium type. Properties, working instructions, and typical applications are presented. 7

PRESSES—Bliss Co., Canton, Ohio. Catalogue 17-D, describing and illustrating Bliss straight-side double-shank presses with capacities ranging from 50 to 2000 tons. Specifications and dimensions are listed. 8

ELECTRODEPOSITION — International Nickel Co., Inc., New York City. Reprint entitled "Building Up Worn Parts By Electrodeposition," explaining the process of electrodeposition as a method of repair, and contrasting the relative advantages of nickel- and chromium-plating. 9

BRONZE BEARINGS—Bunting Brass & Bronze Co., Toledo, Ohio. Catalogue 52, containing 72 pages of complete descriptions of available Bunting bronze bearings and precision bronze bars. Included is a section of engineering data relating to sleeve bearings. 10

PACKINGS — Garlock Packing Co., Palmyra, N. Y. Bulletin describing Garlock molded cups for pump pistons, hydraulic service, and pneumatic equipment. Also described is the company's line of pistons for use with pump cups. 11

HYDRAULIC TOOLS — Blackhawk Mfg. Co., Milwaukee, Wis. Booklet 352, entitled "Idea Book"—64 pages of pictures and brief descriptions, showing how hydraulic tools can solve production, construction, and maintenance problems. 12

POWER TRANSMISSION—Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin D-2306, explaining briefly how the Reliance V*S drive, used in combination with electronic controls, provides rapid reversals for planer service. 13

HYDRAULIC DUPLICATORS—Turchan Follower Machine Co., Detroit, Mich. Catalogue containing information on the company's equipment for converting standard machine tools to operation by hydraulic tracer control. 14

ELECTROFORMING—International Nickel Co., Inc., New York City. Reprint entitled "Engineering Electroforming," describing the processes of electroforming, the materials used, and typical applications. 15

ELECTRIC GRINDERS AND BUFFERS — Hisey-Wolf Machine Co., Cincinnati, Ohio. Catalogue 72, describing and illustrating the company's buffing and polishing machines, and grinding machines. Specifications for each machine are included. 16

WET-BLASTING — American Wheelabrator & Equipment Corporation, Mishawaka, Ind. Bulletin 43, showing the application of wet-blasting to such work as die and mold finishing, tool finishing and deburring, etc. 17

CASTING—Meehanite Metal Corporation, New Rochelle, N. Y. Bulletin 33, entitled "Meehanite Castings Serve All Industry" containing numerous illustrations of industrial applications of Meehanite castings. 18

BUSHINGS—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Leaflet giving engineering information on a new type of "Magic-Grip" bushing for use in "Vari-Pitch" sheaves made by the company. 19

CHASER SHARPENING MACHINE — Jones & Lamson Machine Co., Springfield, Vt. Catalogue 503, descriptive of the J&L universal bench type chaser sharpening machine specifically designed to resharpen chasers. 20

DIES—B. Jahn Mfg. Co., New Britain, Conn. Bulletin entitled "The Story of B. Jahn Production Proved Dies," featuring a graphic account of the company's facilities and die production. 21

SILICONE RUBBER—General Electric Co., Pittsfield, Mass. Bulletin CDS-3, containing com-

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prehensive information on properties, applications, classes, and design specifications of G-E silicone rubber. 22

HARD-FACING ALLOYS—Wall Colmonoy Corporation, Detroit, Mich. Catalogue 77, covering the various hard-facing alloys manufactured by the corporation. Also explained is the Colmonoy Sprayweld process. 23

GRINDING ATTACHMENTS — DoAll Co., Des Plaines, Ill. Bulletin 52-401, describing an attachment making possible a wide variety of cylindrical grinding operations on any surface grinder. 24

CASTINGS — Belle City Malleable Iron Co., Racine, Wis. Folder 12, descriptive of Belmalloy (pearlitic malleable), outlining the characteristics and physical properties of this casting. 25

TUBING—Babcock & Wilcox Co., Beaver Falls, Pa. Bulletin TB-340, on seamless mechanical tubing, and which type—hot-finished, cold-drawn, or "rotc-rocked"—should be chosen for a particular job. 26

STRUCTURAL SHAPES—Kling Bros. Engineering Works, Chicago, Ill. Leaflet descriptive of Kling structural shapes, and showing a few examples of the curved shapes which can be rolled to specific requirements. 27

SALT BATH FURNACES — Ajax Electric Co., Inc., Philadelphia, Pa. Bulletin 123-B, presenting a number of ways of increasing heat-treating efficiency with submerged electrode salt baths. 28

TOGGLE CLAMPS—Danly Machine Specialties, Inc., Chicago, Ill. Catalogue describing the company's line of quick-acting toggle clamps for use in all types of work-holding operations. 29

GRANITE SURFACE PLATES—DoAll Co., Des Plaines, Ill. Bulletin 51-829, presenting features and advantages of granite surface plates for precision measuring and gaging operations. 30

PRECISION SWITCHES—Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Catalogue 82, on precision snap-action switches, giving technical data and application ideas. 31

COUPLINGS — Cone-Drive Gears, Division of Michigan Tool Co., Detroit, Mich. Bulletin CDC-52, listing capacities and specifications for the company's line of flexible couplings. 32

INDUSTRIAL FASTENERS—South Chester Corporation, Lester, Pa. Catalogue B-2, giving information on industrial fasteners for metal-to-metal and metal-to-wood applications. .. 33

POWER PRESSES—Sales Service Machine Tool Co., St. Paul, Minn. Bulletin P-552, descriptive of Press-Rite open-back inclinable power presses having capacities of 5 to 85 tons. 34

ALLOY STEELS—Peter A. Frasse & Co., New York City. Chart offering assistance in the identification of Government specifications on alloy steels. 35

ENGRAVING MACHINES—H. P. Preis Engraving Machine Co., Hillside, N. J. Bulletin B-1, on the company's engraving machine for engraving steel stamps, dies, plastics, etc. 36

LUBRICATION—Bijur Lubricating Corporation, Rochelle Park, N. J. Bulletin NB-9, showing applications of the company's lubricators on a chuck machine and a food wrapping machine. 37

SPECIAL CUTTING TOOLS — National Tool Co., Cleveland, Ohio. Booklet describing operations at the National Tool Co. and the relations of the company to the cutting tool industry. 38

SURFACE GRINDERS — Mattison Machine Works, Rockford, Ill. Circular on the Mattison high-powered precision surface grinder, containing operational pictures and specifications. 39

TEMPERATURE-RESISTANT SEALING RINGS—Parker Appliance Co., Cleveland, Ohio. Catalogue 5160A1, giving data and dimensions for Parker precision O-rings. 40

PRESSES — Federal Machine & Welder Co., Warren, Ohio. Bulletin outlining construction features of Warco straight-side double crank presses. Press components are clearly identified in cross-sectional drawings. 41

INSPECTION AIDS—Engineering Developments Inc., Portsmouth, R. I. Leaflet descriptive of Magnivision inspection and assembly aids for use in fine inspection and assembly work. 42

ABRASIVE DISCS—Gardner Machine Co., Beloit, Wis., 54-page guide-book containing helpful information for users of abrasive discs on surface grinding operations. 43

PLASTIC STOCK PARTS — Dimco-Gray Co., Dayton, Ohio. New 1952 Catalogue of stock molded plastic parts such as knobs, handles, terminal strips, and similar components. 44

HOBS — Standard Tool Co., Cleveland, Ohio. Leaflet consisting of a hob tolerance chart for standard single-thread hobs and of specific suggestions when ordering hobs. 45

ARC-WELDERS — Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet V-5453, giving up-to-date information on the Westinghouse D-C rectifier welder. 46

GEARS—Sier-Bath Gear & Pump Co., North Bergen, N. J. Folder entitled "Gear Errors Are Costly," showing how Sier-Bath precision gears are produced. 47

PUSH-BUTTON CONTROLS — Arrow-Hart & Hegeman Electric Co., Hartford, Conn. Folder descriptive of the complete Arrow-Hart line of oil-tight push-button controls. 48

CUT-OFF SAW BANDS—DoAll Co., Des Plaines, Ill. Bulletin 51-803, describing DoAll cut-off saw bands for horizontal and vertical type machines. 49

SHEARS—Kling Bros. Engineering Works, Chicago, Ill. Bulletin 2345, on Kling double-angle shears designed to handle flats, bars, and angles. 50

VAPOR RUST PREVENTIVES — Angier Sales Corporation, Framingham, Mass. Folder explaining and illustrating, the vapor wrap method of protecting metal from rust. 51

TURRET PUNCH PRESS—Wiedemann Machine Co., Philadelphia, Pa. Leaflet descriptive of the Type R-41P motor-driven turret punch press. 52

WORM-GEAR MOTORS—U. S. Electrical Motors, Inc., Los Angeles, Calif. Bulletin on the Type GW Syncrogear, a new low-speed, right-angle worm-gear motor. 53

LATHES—Rivett Lathe & Grinder Inc., Boston, Mass. Bulletin 500-F, descriptive of Rivett tool-room lathes and grinders for precision work. 54

THREAD GAGES—Detroit Tap & Tool Co., Detroit, Mich. Bulletin SG-52, listing prices of standard thread gages made by the company. 55

VISES — Float-Lock Corporation, Bloomfield, N. J. Bulletin descriptive of Float-Lock safety vises for use on band saws and drill presses, showing a variety of set-ups. 56

METAL STAMPS—Dickey-Grabler Co., Cleveland, Ohio. Catalogue descriptive of metal stamps and other marking devices made by the company. 57

DRILL JIG BUSHINGS—Colonial Bushings, Inc., Fraser, Mich. Folder listing prices for Colonial ASA standard drill jig bushings. 58

ROD PACKINGS—Garlock Packing Co., Palmyra, N. Y. Bulletin outlining the advantages of Lattice-Braid rod packings. 59

VALVES — Valvair Corporation, Akron, Ohio. Circular on Valvair air-controlled valves for diversified operations 60

DIE-CASTINGS—Dollin Corporation, Irvington, N. J. Folder picturing typical small zinc die-castings made by the company. 61

VISES — Producto Machine Co., Bridgeport 1, Conn. Bulletin TE2-104, describing plain and swivel type heavy-duty 6-inch vises. 62

GAGES—Nilsson Gage Co., Poughkeepsie, N. Y. Catalogue D on Nilco dial bore, snap, groove, and pitch diameter gages. 63

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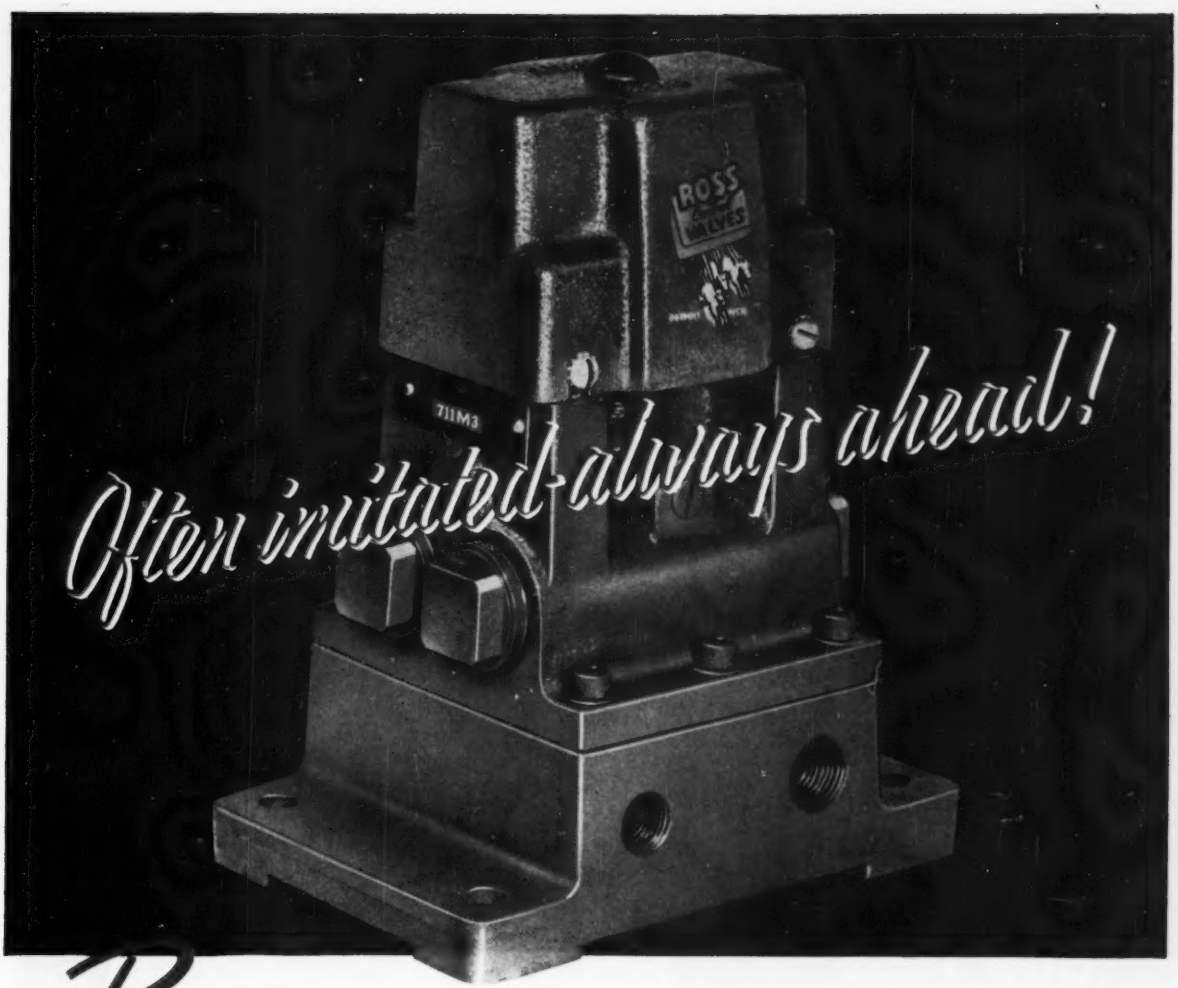
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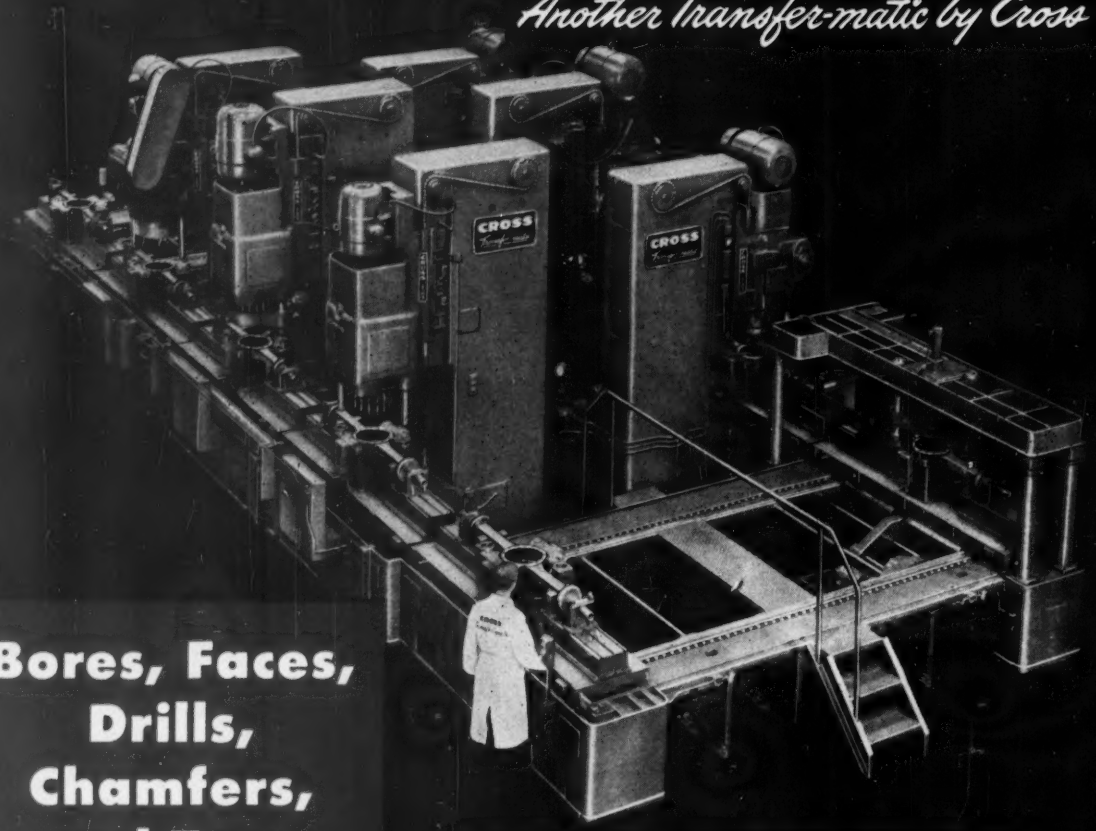
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Between Grinds

By E. S. Salichs

Posting on Toasting

A large oven employed in a Pacific Coast aircraft plant for curing plastic noses and radomes bears this sign: *Do Not Warm Lunches in This Oven.* With the decision going against casseroles, it's back to salads and ice cream, boys.

"Dear Editor:

I have a number of eye-catching baby photographs that will delight your readers. You can use them with humorous captions. All the world loves a baby." Sorry, solicitor, our pin-up material is strictly the mechanical kind.

Hard Hats and Coronets

The Turtle Club now numbers seventy-five members—all lucky workers over the country whose lives have been saved by wearing safety hats. Had they not had on these Fiberglas-reinforced plastic helmets, they would have been laid low (6 feet) by heavy falling objects and would now be sporting coronets instead of the hats they swear by. Club is sponsored by the E. D. Bullard Co. of San Francisco.

Roger, Richard

The description of a new product which we received was followed up by an amendment in which two production figures were changed—accompanied by this explanation: "The engineer wanted to make his offspring look as good as possible. I took him at his word and used the figures quoted as fact. In discussion since then it turned out that he inadvertently 'stretched' two points. Kindly forgive the error; I did not mean to be deceitful." And the explanation was signed "Honest Richard...." Were ours the lurid confession type magazine, the title of this story might be "I Was the Dupe of an Engineer."

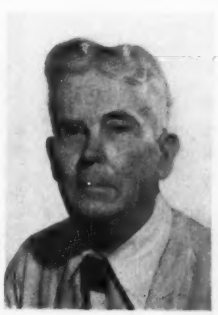
Don't Mention It!

To begin with, our knowledge of German is limited to several words. Gesundheit is one that we bestow upon sneezers. But always under the impression that we have been saying the equivalent of "God Bless You." Much surprised we were, then, when a German magazine came to our desk called "Gesundheits Ingenieur." God Bless You, Engineer didn't seem to be the correct translation. Upon inquiry, we finally learned that Health is what we have been wishing people and what has been wished upon us. Now we are going to investigate Danke Schoen, our reply.

They Train on Terrain

Located on Hills and Dales Road in Canton, Ohio, is Huffman & Co., the agent for the Johnson Machine & Press Corporation. Enough to make any man huff.

FATHER AND SON CONTRIBUTORS—R. S. and R. W. Newton have not only the common interest of being closely related but also of being engineers who occasionally write articles for MACHINERY. In this issue, articles individually written by them are appearing on pages 201 and 187, respectively. R. S. (father) was born on a farm in New York State, and after a teen-age glance at California, returned to the farm and a drafting course. Then started work with the American Locomotive Co. Later he joined the New York Air Brake Co., Watertown, where he was employed from 1907 until his retirement two years ago. During World War I he was production engineer of the 75-millimeter gun carriage plant; during War II he was solving problems on the manufacture of M4 tank hulls, etc. R. W. (son) was born in Watertown, studied engineering, and then became an apprentice draftsman in the same company where his father worked. He advanced to the position of assistant chief tool designer before transferring to the International Business Machines Corporation in Poughkeepsie as a tool engineer. Then there is an eight-year old Newton who hasn't gotten around to serious engineering as yet. But if grandpop and pop are bending the twig, there'll be junior shop kinks on our Editor's desk before long!



R. S. Newton



R. W. Newton

News OF THE INDUSTRY

California

CHARLES P. EVANS has been appointed works manager of the Arrowhead Rubber Co. plant at Downey, Calif. The company manufactures precision molded rubber parts, and is a subsidiary of National Motor Bearing Co., Inc., Redwood City, Calif.

RALPH H. COCKROFT has been appointed special sales representative for the Worcester Pressed Steel Co., Worcester, Mass., in southern California. Mr. Cockroft has his headquarters at 416 Citizens Bank Bldg., Pasadena, Calif.

THOMAS A. HARVEY has been promoted to the position of western regional manager of the Cullman Wheel Co., Chicago, Ill. Mr. Harvey has established an office at 418 N. Glendale Ave., Glendale 6, Calif.

AIRESEARCH MFG. CO., Los Angeles, Calif., recently moved its engineering department to a new building at 9225 Aviation Blvd., Los Angeles, Calif.

Connecticut, Massachusetts, and Rhode Island

ARTHUR M. STONER, vice-president in charge of engineering of the Jacobs Mfg. Co., West Hartford, Conn., will be awarded the Certificate of Merit by the Franklin Institute of the State of Pennsylvania, Philadelphia, Pa., for his development of a chuck and collet combination for lathes to hold cylindrical work being machined. Formal presentation of the award will be made to Mr. Stoner at the Institute's Medal Day ceremonies in Franklin Hall on October 15. The device which Mr. Stoner developed—the "Spindle Nose Lathe Collet Chuck"—has been in commercial use since 1949, and is now widely used on machine tools both in this country and abroad.



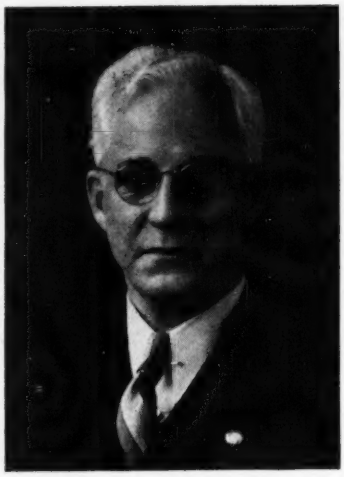
Arthur M. Stoner, vice-president of the Jacobs Mfg. Co., who will be awarded the Certificate of Merit by the Franklin Institute

HARRY E. SLOAN, president of the Cushman Chuck Co., Hartford, Conn., was recently elected chairman of the board, and HARRY E. SLOAN, JR., who was vice-president and secretary, was appointed president, succeeding his father. The senior Mr. Sloan, son of Adrian Porter Sloan who started with Cushman as a mechanic in 1866 and became one of the three original incorporators in 1885 (the other two being A. F. Cushman, founder, and his son, E. L. Cushman), will complete fifty-three years of consecutive service with the company this fall. He became vice-president in 1919, and president nine years later. Also announced was the promotion of WILLIAM C. GAW from the position of sales manager to that of vice-president in charge of sales.

ROBERT H. POULTON has been appointed representative, technical sales, by the Flexible Tubing Corporation, Guilford, Conn. Mr. Poulton, who was chief inspector in the Flexflyte department, in his new assignment will render engineering assistance to the aircraft industry and other original equipment manfacturers.

LOUIS V. GAGNON has been appointed sales representative for Massachusetts by Frederic B. Stevens, Inc., Detroit, Mich., manufacturer of metal-finishing equipment and supplies. His headquarters will be located at the company's New England branch office in New Haven, Conn.

MILTON F. BEECHER, head of the research and development laboratories since 1941, of the Norton Co., Worcester, Mass., has retired as vice-president and director. Mr. Beecher was with the company for thirty-seven years. He will be succeeded by WALLACE L. HOWE, director of research and development. Other changes in personnel are as follows: DAVID REID, assistant superintendent of organic products, has been named superintendent of the grain and bond plants; ROGER J. DUFRESNE, assistant foreman of the resinoid department, will fill the position vacated by Mr. Reid; and PAUL B. FOXWELL, abrasive engineer, has been assigned to western Missouri, eastern Kansas, and Oklahoma, replacing FREDERICK L. ANDERSON, who resigned. Mr. Foxwell's headquarters will be in St. Louis, Mo.



Milton F. Beecher, vice-president and director of the Norton Co., who is retiring

CONTINENTAL SCREW CO., New Bedford, Mass., announces the following appointments: HARVEY F. PHIPARD, JR., director of research and engineering; EDWARD J. LOCKE, JR., chief engineer; and GEORGE E. JENNEY, JR., master mechanic.

KENDALL C. WHITE has joined the Wico Electric Co., West Springfield, Mass., in the capacity of production manager.

BROWN & SHARPE MFG. CO., Providence, R. I., has recently set up the Precision Tool and Gage Division, which will be a direct function of the vice-president for production and engineering. WALLACE E. ANDERSON, who has had both production and sale assignments in the company, has been promoted to superintendent of this Division. He will assume full

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Wallace E. Anderson, superintendent of new Precision Tool and Gage Division of the Brown & Sharpe Mfg. Co.

charge of the development and manufacture of precision tools. SAMUEL H. WAUGHTEL, JR., has been named Division foreman.

Illinois

A. G. NEESE has become district sales manager in Chicago, Ill., for the Sharon Steel Corporation, Sharon, Pa., replacing H. S. GIER, who has resigned. C. W. DIVEEN, JR., has been made assistant sales manager in the Philadelphia, Pa., district.

J. A. HANDLEY, vice-president and chief executive officer of the Whiting Corporation, Harvey, Ill., has been elected president of the corporation. He was also made a director.

HOWARD B. CARROLL has been made assistant sales manager of the Sheldon Machine Co., Inc., Chicago, Ill., manufacturer of metal-working lathes, milling machines, and shapers.

LEONARD L. ROBB has been named to head wholesale sales of Alemite lubrication equipment and Stewart-Warner instruments, by the Stewart-Warner Corporation, Chicago, Ill.

Maryland, North Carolina, and Florida

BLACK & DECKER MFG. CO., Towson, Md., recently opened a branch plant at Hampstead, Md. Thirty miles from the company's headquarters, the new plant occupies 100,000 square feet of land in a farm area, ultimately to be expanded to a total of 1,000,000 square feet.

ELMER F. MYERS, sales engineer for the Farrel-Birmingham Co., Inc., Ansonia, Conn., has been transferred from the New England territory to Fayetteville, N. C. (Box 3157).

ALLEN-BRADLEY CO., Milwaukee, Wis., manufacturer of electric motor controls, has appointed a new commission agent in Florida: ROBERT P. SMITH & CO., 2031 Hendricks Ave., Jacksonville, Fla. This company is headed by R. P. Smith, and associated with him is C. R. LEE, who recently joined the company. A branch office is located at 121 S. E. First St., Miami, Fla., with C. M. CONVERSE in charge.

Michigan and Indiana

CARBOLOY DEPARTMENT OF GENERAL ELECTRIC CO., Detroit, Mich., is expanding its engineering staff by the appointment of the following men to newly created executive positions: E. W. ENGLE, product and process engineering manager; E. E. GEORGE, design and application engineering manager; R. A. CANNING, production engineering manager; and R. L. BROWNLEE, administrative engineer.

W. B. JOHNSON, who was advertising manager of heating equipment in the Ingersoll Products Division, of the Borg-Warner Corporation, Chicago, Ill., at Kalamazoo, Mich., has become sales promotion manager in the Norge Heat Division of the corporation, also at Kalamazoo.

E. SWAIN RUSSEY was recently elected president of Warner Gear Division, Muncie, Ind., of the Borg-Warner Corporation, Chicago, Ill. He succeeds A. P. EMMERT, who has retired after twenty-five years of service with the Division, the last eight of which he was president. Mr. Emmert will continue in an advisory capacity in the affairs of the Division, and also as a vice-president of the Borg-Warner Corporation. Also announced was the appointment of four departmental executives in the Division to vice-presidencies: T. J. AULT, WILLIAM H. CORTWRIGHT, JOHN C. OESTERLE, and ANDREW W. ROSE.

New York and New Jersey

AMERICAN ASSOCIATION OF MACHINERY IMPORTERS, INC., has been organized by a group of American importers of European machinery. The aim and purpose of the Association is to assure the American machine tool buyer that only the finest equipment will be imported and distributed by members, that machines imported by them will be represented fairly, and that complete servicing facilities and spare parts will be readily available. Officers elected are as follows: President, MILTON D. THALBERG; first vice-president, GEORGE R. VONDERAHE; and second vice-president, HENRY A. NAU. Charter members are: ERIC R. BACHMANN; BRITISH INDUSTRIES CORPORATION; FERROSTAAL OVERSEAS CORPORATION; H. E. B. MACHINE TOOLS, INC.; MBI IMPORT-EXPORT CO., LTD.; KURT ORBAN CO., INC.; PERMASCO DIVISION, PERRISH STEEL PRODUCTS, INC.; STOKVIS-EDERA & CO.; and TRIPLEX MACHINE TOOL CO. Offices for the Association will be at 115 Broadway, New York 6, N. Y.

The Manufacturing Services Division of the GENERAL ELECTRIC CO., Schenectady, N. Y., has formed four new departments with the following executives in charge: C. WILLARD BRYANT, manager of materials, Materials Services Department; ROBERT L. YOWELL, acting manager of manufacturing facilities, Manufacturing Facilities Services Department; WILLIAM W. BEARDSLEE, manager of manufacturing engineering, Manufacturing Engineering Services Department; and JOHN S. MACDONALD, manager of manufacturing administrative practices, Manufacturing Administrative Practices Services Department. A fifth new department, Manufacturing Research and Development Services, has also been established. Headquarters of these departments will be in Schenectady.

FREDERICK G. RAHE was recently appointed sales engineer in the metropolitan New York and New Jersey areas for the Butterfield Division of the Union Twist Drill Co., Derby Line, Vt., manufacturer of twist drills, taps, dies, reamers, and other metal cutting tools. Mr. Rahe's headquarters will be at 28-30 Park Place, New York City.

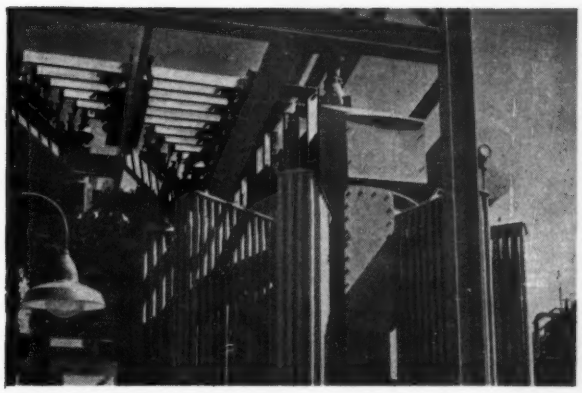
CARBORUNDUM METALS CO., INC., a recently formed subsidiary of the Carborundum Co., Niagara Falls, N. Y., is to build a new plant for the production of zirconium and hafnium sponge metals. The plant will be situated on an eighteen-acre plot at Hake and Clarence Center Roads, Akron, N. Y.

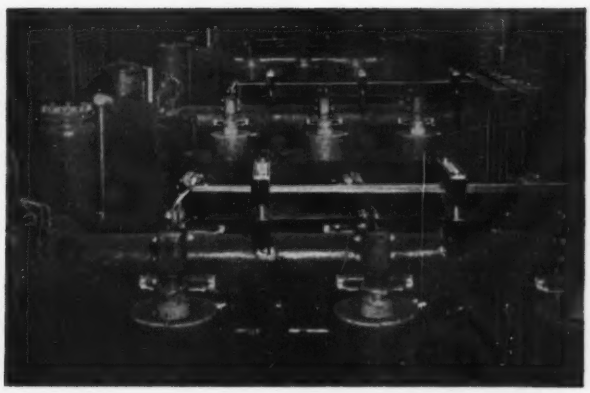
KURT ORBAN CO., INC., New York City, has been appointed American distributor for SCHIESS A. G., Dusseldorf, Germany, builder of heavy machine tools such as vertical boring mills, vertical turret lathes, and horizontal boring and milling machines.

JAMES F. WALTERS has been appointed industrial sales engineer in the Buffalo, N. Y., territory for the Parker Appliance Co., Cleveland, Ohio.

RAYBESTOS-MANHATTAN, INC., Passaic, N. J., announces the opening of a warehouse at 3012 Canal St., Hous-

It takes a Lot of Copper to make a Lot of Chemicals!





These photographs show a lot of copper bus bar in a new plant of a great chemical company, whose name and location cannot be disclosed. The copper carries heavy currents to electro-chemical equipment for the production of valuable products used in national defense and in industry. Revere furnished 325,000 pounds of bus bar for this service, the bar going into substations, rectifier stations, and cell houses. In addition, at the time of installation the Revere Technical Advisory Service collaborated with the customer in working out some difficult details in the design of switches. If you need electrical conductors, remember that copper has the highest electrical conductivity of all the commercial metals, that Revere makes bus bar, and that the Revere Technical Advisory Service is always ready to work with you on any problem concerning copper and its alloys or aluminum alloys. Call the nearest Revere Sales Office.

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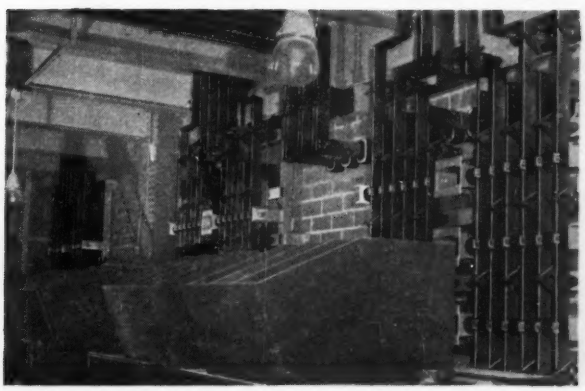
Founded by Paul Revere in 1801

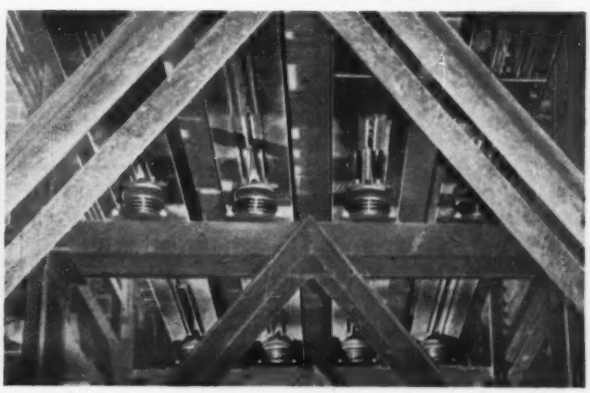
230 Park Avenue, New York 17, N. Y.

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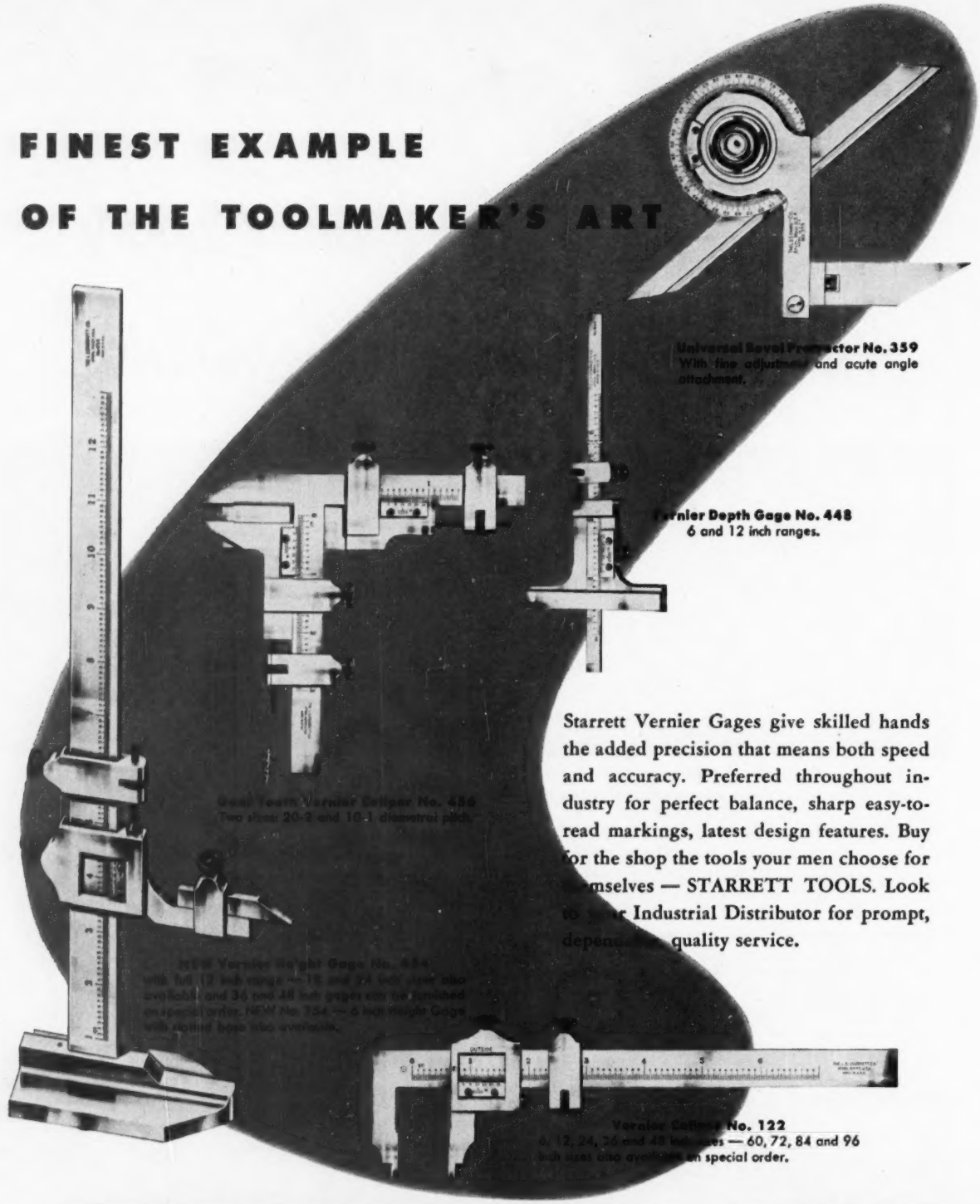
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Universal Bevel Protractor No. 359
With fine adjustment and acute angle attachment.

Vernier Depth Gage No. 448
6 and 12 inch ranges.

Starrett Vernier Gages give skilled hands the added precision that means both speed and accuracy. Preferred throughout industry for perfect balance, sharp easy-to-read markings, latest design features. Buy for the shop the tools your men choose for themselves — STARRETT TOOLS. Look to your Industrial Distributor for prompt, dependable quality service.

Vernier Caliper No. 122
6, 12, 24, 36 and 48 inch sizes — 60, 72, 84 and 96 inch sizes also available on special order.

STARRETT TOOLS

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WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

- Prompt delivery
- Dependable service
- Quality products

IN-FEED CENTERLESS GRINDING TROUBLES AND HOW TO CORRECT THEM—1

Trouble	Probable Cause	Suggested Corrective Step
Chatter	End-stop is slightly off center with respect to the work, causing eccentric motion.	Set end-stop so that it bears directly at the center of work rotation.
Scored Work	Loaded wheel face, which indicates grinding wheel is too hard or too fine.	Use softer grade or coarser grit wheel. Also use type of coolant with high detergent qualities to help keep wheel face clean.
	Dirty coolant, abrasive particles embedded in work blade, or chips fused to work blade.	Change coolant and clean tank. Use richer mixture of coolant. Use a coolant which has more lubricity. A work blade tipped with material softer than part being ground should be employed.
Out-of-Round Work	Center of work is too close to the center line of the wheels.	Raise work blade to bring work center well above center lines of wheels. In some cases, this adjustment might require softer wheels to eliminate chatter on the work-piece.

MACHINERY'S Data Sheet No. 713, September, 1952

Compiled by the Norton Co. Worcester, Mass.

IN-FEED CENTERLESS GRINDING TROUBLES AND HOW TO CORRECT THEM—2

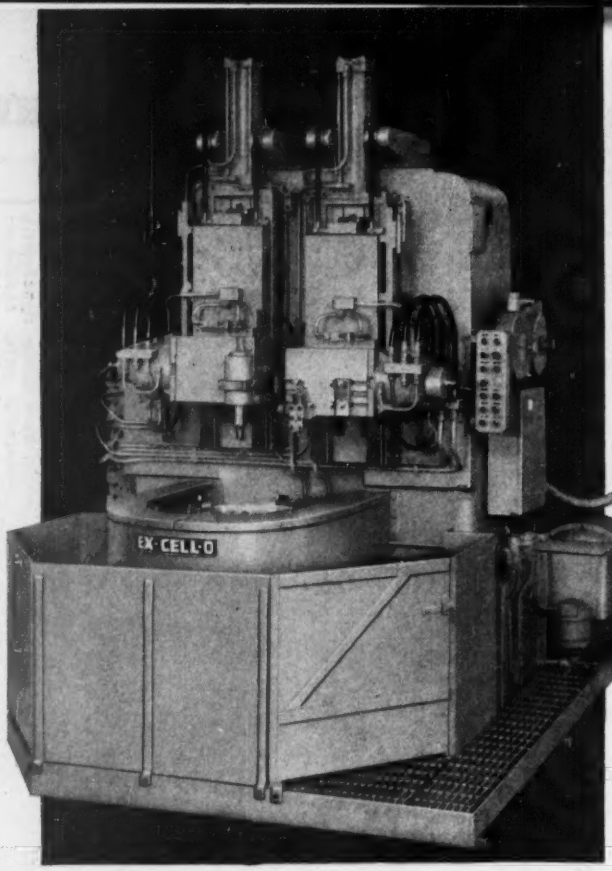
Trouble	Probable Cause	Suggested Corrective Step
Tapered Work	Bent work blade. Warped or improperly located blade. (This causes work to be tipped in machine.)	Check work blade for straightness and alignment in relation to grinding wheel spindle. If bent, replace work blade. A straightedge and indicator should be used here.
	Tapered face on either grinding wheel or regulating wheel.	Check truing attachment for alignment, and retrue wheels if any adjustment is made. If taper still persists, swivel truing attachments (by trial and error) to true taper on the wheels, opposite to the taper on the work.
Variation in Work Size	Worn in-feed mechanism.	Replace or adjust in-feed screw on nut, or both.
	Loose regulating wheel.	Check flange bolts on regulating wheel spindle and regulating wheel hole size to be sure spindle is not under size or wheel hole outside the over-size limits.
Flat Spots on Work	Insufficient driving power between work and regulating wheel, causing intermittent contact. (Usually encountered where work is relatively heavy and stock removal is light.)	Equip machine with pressure roll which forces work down tighter against work blade and regulating wheel.

MACHINERY'S Data Sheet No. 714, September, 1952

Compiled by the Norton Co. Worcester, Mass.

New!

VERTICAL PRECISION BORING MACHINE BY EX-CELL-O



The new Ex-Cell-O Style 425 Vertical Precision Boring Machine.

XLO
EX-CELL-O for PRECISION

A Flexible, Automatic Machine for Precision Boring, Turning, Facing

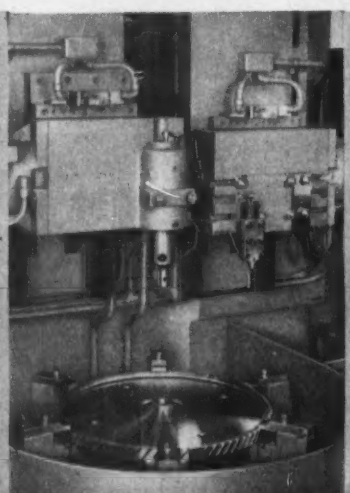
Developed by Ex-Cell-O, this standard Style 425 Vertical Precision Boring Machine is massive and versatile. It has a heavy-duty, high-speed work spindle and rigid tool slides for close-tolerance work with a fine surface finish. It's designed for accurate production work on large parts.

The heavy cast base supports a column on which two vertical slides are mounted, each carrying a cross slide. Slides are operated by large hydraulic cylinders and move on hardened and ground steel ways. Vertical slides are fully counterweighted. All these features mean smoother operation.

The large work spindle supports a 36-inch diameter table having T-slots for mounting fixtures. The table is driven through a precision worm at variable speeds up to 500 rpm.

The machining cycle is completely automatic, including movements of vertical and cross slides, changes in work speeds, flow of coolant, and lubrication.

For more information and complete specifications on this new machine call in your Ex-Cell-O representative or contact Ex-Cell-O in Detroit today.



Close-up view of the Style 425 equipped for operations on an aluminum jet compressor wheel. Tools in the left slide precision bore, counterbore and chamfer the central hole, then feed-face the small hub. The right slide finishes a rabbet in the large outer rim.

12 Features OF EX-CELL-O'S NEW MACHINE:

- Massive, Rigid Construction
- Easy Loading and Unloading
- Variable Speeds to 500 RPM
- Counterweighted Slides
- Large Hydraulic Cylinders
- Hardened and Ground Ways
- Flexible Automatic Cycles
- Automatic Speed Changes
- Automatic Coolant Control
- Automatic Lubrication
- Conforms to J.I.C. Standards
- Skilled Operator Unnecessary

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

52-23

ton, Tex., and another at 4500 York St., Denver, Colo. The company also has appointed the WEBSTER-ROBINSON MACHINERY & SUPPLY CO., INC., as a distributor in Tacoma, Wash.

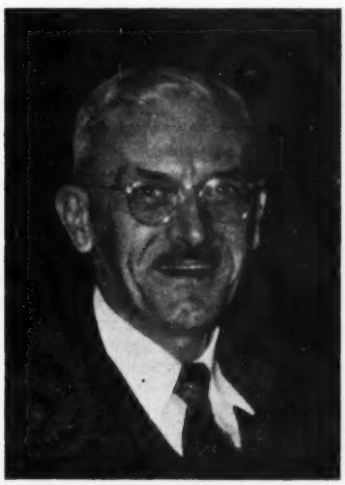
JOHN R. GILMARTIN was recently appointed general sales manager of the Hyatt Bearings Division, General Motors Corporation, Harrison, N. J., succeeding HOWARD K. PORTER. Mr. Porter has been named assistant to the general manager on special assignments.

HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio, announces that its eastern district, formerly located at 500 Fifth Ave., New York City, is moving to 352 Cedar Lane, Peoples Trust Co. Bldg., Teaneck, N. J.

Ohio

PRECISION METALSMITHS, INC., Cleveland, Ohio, announces the appointment of the following sales representatives: R. L. TATE, C. B. Lawrence Co., 404 Frick Bldg., Pittsburgh, Pa.; BADER TOOL & ENGINEERING CO., 1106 E. Lake St., Minneapolis, Minn.; and DAVID T. APPLEBEE, 6 Monument Square Bldg., Grand Rapids, Mich.

GEORGE H. ACKER has been elected executive vice-president of the Cleveland Worm & Gear Co. and its subsidiary, the Farval Corporation, both of Cleveland, Ohio. Mr. Acker joined the Cleveland Worm & Gear Co. in 1923, and as chief engineer was responsible for many design improvements in worm-gear speed reducers and in centralized lubrication systems. In 1942 he was appointed vice-president in charge of engineering, the position he held until now.



George H. Acker, executive vice-president of the Cleveland Worm & Gear Co. and its subsidiary, the Farval Corporation

RALPH O. BETTISON has been appointed field engineer in the Pontiac, Mich., area by the Bellows Co., Akron, Ohio, manufacturer of air-powered devices. CLIFFORD S. VAUGHN has been named assistant western regional manager, and will make his headquarters at the company's office in Los Angeles, Calif.

W. WENTZ ALSPAUGH is joining the Ohio Knife Co., Cincinnati, Ohio, manufacturer of industrial knives, in the capacity of sales engineer. He will be located in Salem, Ohio. Mr. Alspaugh was formerly associated with the E. W. Bliss Co., Canton, Ohio.

MALCOLM ROBERTS has joined the Cleveland, Ohio, Machine Tool Division of Kurt Orban Co., Inc., New York City. Mr. Roberts has been active in the machine tool industry for a number of years.



Roland H. Johnson, who is rejoining the E. W. Bliss Co. in an executive capacity

ROLAND H. JOHNSON, former sales manager of the Can Making Machinery Division for E. W. Bliss Co., Canton, Ohio, has rejoined the company in an executive capacity.

J. F. BARTHLEMESS has been appointed field representative in Ohio, Michigan, and Kentucky for Standard Locknut & Lockwasher, Inc., Indianapolis, Ind. Mr. Barthlemess will have his headquarters at 2802 Sagamore Road, Toledo, Ohio.

JOHN W. QUEEN has been appointed manager of the Cleveland, Ohio, plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill., steel distributors. Mr. Queen joined the sales staff in 1933 in New York City, and in 1947 became manager of the alloy steel division in Chicago. Mr. Queen replaces WILLIAM O. SPRINGER at the Cleveland plant, the latter assuming special administrative duties in the Ryerson organization.



John W. Queen, new manager of the Ryerson Cleveland plant

HARLIE F. BYRNE is joining the Artisan Metal Works Co., Cleveland, Ohio, in the capacity of sales manager. Mr. Byrne will coordinate all sales activities for the company's line of fabricated metal products.

UNITED STATES DRILL HEAD CO., Cincinnati, Ohio, recently purchased an additional building for the use, in part, of its newly expanded engineering department.

Pennsylvania

W. S. MCCHESNEY has been made manager of foil sales for the Aluminum Co. of America, Pittsburgh, Pa., succeeding T. A. TORRENCE. Mr. Torrence, who held this position for the past twenty-four years, will continue with the company as chief technical consultant on foil sales. Also announced was the appointment of HARRY L. SMITH, JR., manager of sheet and plate sales, to the newly created position of staff manager—product sales. W. T. MITMAN, who was in the company's Washington, D. C., sales office, will succeed Mr. Smith as manager of sheet and plate sales.

CARPENTER STEEL CO., Reading, Pa., announces the following promotions: S. C. SHAPLEIGH has been named branch manager and F. J. WELDON, assistant branch manager, Bridgeport, Conn.; F. J. MCCARTY, assistant branch manager, Hartford, Conn.; J. D. NELSON, assistant branch manager, Providence, R. I.; P. W. HOLTZ, branch manager, Chicago, Ill.; and C. W. WINDFELDER, branch manager, Milwaukee, Wis.

R. MASON SCHEETZ has been appointed district manager of sales in the Philadelphia-New York City area for the Columbia Steel & Shafting Co. and its Summerill Tubing Co. Division, Pittsburgh, Pa. Headquarters for Mr. Scheetz will be 7616 City Line Ave., Philadelphia, Pa.

ROBERT A. MCLAUGHLIN has been appointed director of sales for the new Fiber Glass Division of the Pittsburgh Plate Glass Co., Pittsburgh, Pa. Mr. McLaughlin had been manager of the Mineola, N. Y. warehouse at the time of his appointment. He will now be in Pittsburgh.

ALBERT W. BOEGNER, who was purchasing agent at the Philadelphia, Pa., plant of the Link-Belt Co., Chicago, Ill., has been transferred to the new Colmar, Pa., plant, in the same capacity. F. WALTER SKERRETT succeeds Mr. Boegner as purchasing agent in the Philadelphia plant.

GLEN MCDOWELL was recently appointed sales manager of Lewis rolls of the Blaw-Knox Co., Pittsburgh, Pa. Mr. McDowell succeeds J. M. LEWIS, who has been made assistant to the assistant vice-president in charge of both Pittsburgh and Lewis roll sales.

RAYMOND T. WHITZEL, assistant manager, has been made general manager of the smelting division of the Aluminum Co. of America, Pittsburgh, Pa., succeeding V. C. DOERSCHUK. The latter becomes technical consultant.

SAMUEL SLOAN AUCHINCLOSS has been named executive vice-president of DeWalt, Inc., Lancaster, Pa., subsidiary of the American Machine & Foundry Co., and manufacturer of power cutting tools for wood, metal, and plastic.

RICHARD T. VOELZ and TRUMAN S. BROWN were recently appointed field representatives for the Chicago, Ill., and Los Angeles, Calif., sales offices, respectively, of the J. F. Stokes Machine Co., Philadelphia, Pa.

M. E. CUNNINGHAM Co., Pittsburgh, Pa., manufacturer of steel stamps, dies, and other marking tools, has acquired a new plant in Pittsburgh, which will more than double its area.

H. O. TRERICE Co., Detroit, Mich., manufacturer of temperature and pressure instruments, has opened an office at 1304 Spring Garden St., Philadelphia, Pa., with ALBERT H. ROGERS, JR., as manager.

M. B. SQUIRES Co., 1202 Grant Bldg., Pittsburgh, Pa., has been appointed sales representative for the CORNISH WIRE CO., INC., New York City.

MACHINERY ASSOCIATES, INC., Philadelphia, Pa., is moving to larger quarters at 325 E. Lancaster Avenue, Wynnewood, Pa.

Wisconsin

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., has set up a regional field service with the following supervisors: B. F. UREDA, Chicago, Ill., midwest region; A. S. HILL, Cleveland, Ohio, central region; D. T. THOMAS, New York City, Empire region; C. P. SUYKERBUYK, Atlanta, Ga., southeast region; E. G. KIME, Dallas, Tex., southwest region, and D. W. SEAGRAVE, San Francisco, Calif., Pacific region. Also announced was the purchase of the plant of VICTOR ELECTRIC PRODUCTS, INC., in Cincinnati, Ohio. Texrope sales, engineering, and production facilities will be moved from the company's plant in West Allis, Wis., to the newly acquired plant, which becomes part of the Norwood Works.

J. H. BRINKER has been appointed assistant executive in charge of distribution at the A. O. Smith Corporation, Milwaukee, Wis. Mr. Brinker was formerly general sales manager of the southwest district for the firm.

FRANK T. FREY has been promoted to the position of executive vice-president of Geuder, Paeschke & Frey Co., Milwaukee, Wis. Mr. Frey will head both the purchasing and manufacturing divisions of the company.

F. C. MCNICOL has been appointed division manager, industrial control sales, for Cutler-Hammer, Inc., Milwaukee, Wis. Mr. McNicol has been with the company since 1935 in various sales capacities.

GEORGE K. CASSADY, assistant to the sales manager of the Giddings & Lewis Machine Tool Co., Fond Du Lac, Wis., has been promoted to the position of assistant general sales manager of the company.



George K. Cassady, assistant general sales manager of Giddings & Lewis Machine Tool Co.

A. M. NAYSMITH has been promoted from the position of plant engineer to that of general superintendent of the Macwhyte Co., Kenosha, Wis., manufacturer of wire rope. R. B. WHYTE, JR., has been made assistant general superintendent and assistant plant engineer.

R. H. MORSE, III, has been appointed general manager of the Beloit, Wis., Works of Fairbanks, Morse & Co., Chicago, Ill. He succeeds ORREN S. LESLIE, who has been named manager of manufacturing and transferred to headquarters in Chicago.

New Books

DESIGN AND USE OF CUTTING TOOLS. By Leo J. St. Clair. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. 437 pages, 6 by 9 1/4 inches. Price, $7.

The aim of this book is to present simply and clearly the basic information on cutting tools that should be part of every machinist's knowledge. Misuse of cutting tools is costing the machining industry millions of dollars per year, according to the author, whose intention it is to help correct cutting tool abuses. The book is also intended to help key men throughout the industry in their instructional and educational efforts to bring about improvements in the use of cutting tools.

Chapter headings, which give an indication of the book's coverage, are as follows: Single-Point Cutting Tool; Side Relief Angle; How to Measure Angles; End Relief Angle; Nose Radius and Point Angle Relief; Angle of Clearance; Peripheral Grinding; Side Rake Angle; Back Rake Angle; Side Cutting Edge Angle; End Cutting Edge Angle; Nose Radius and Point Angle; Cutting Rake Angle; Proper Choice of Cutting Tools; Cutting Edge and Chip Formation; Chip Breakers; Speeds and Feeds; and Grinding Cutting Tools.

DRILLS AND DRILLING PRACTICE. 62 pages, 8 1/2 by 11 inches. Published by the National Automatic Tool Co., Inc., Richmond, Ind. Price, $1.

The second edition of this book by R. A. Schafer, chief development engineer of the National Automatic Tool Co., contains comprehensive information on drills and drilling all kinds of material, being based on over fifty years' experience of the company in the active application of drilling practices. Engineering data and tables commonly used by those engaged in the drilling of metals and the like are included for reference purposes.



The *Sheffield* Precisionaire is an all-around gage

The Sheffield Precisionaire Gage is equally applicable to all phases of inspection—receiving, tool room, process, quality control and final. Practically any dimension or relationship between elements can be measured.

It is ideal for guiding the individual machine operator in preventing scrap loss. It may be used as a comparator. Also, because of its linear scale, it gives precisely the value of the dimensions being measured so that parts may be classified in size ranges. This assures greater accuracy and faster assembly.

The work may be presented to the gage, or the gaging element at the end of a flexible tube may be presented to the work at any distance from the base instrument without loss of accuracy or gaging speed.

The wide range of amplifications from less than 1,000 to more than 100,000 to 1 provides an adequate choice to meet any set of gaging requirements.

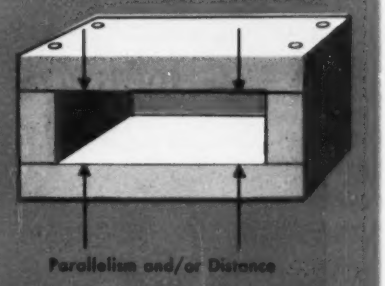
Call your local Sheffield representative or write for Bulletin CTP-491 which gives complete specifications.

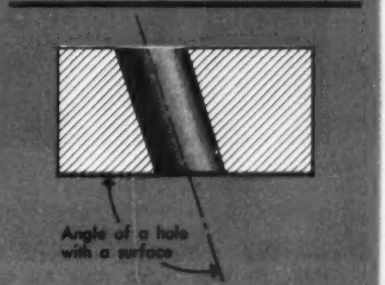
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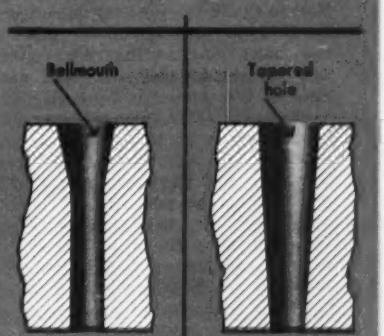
Dayton 1, Ohio, U.S.A.

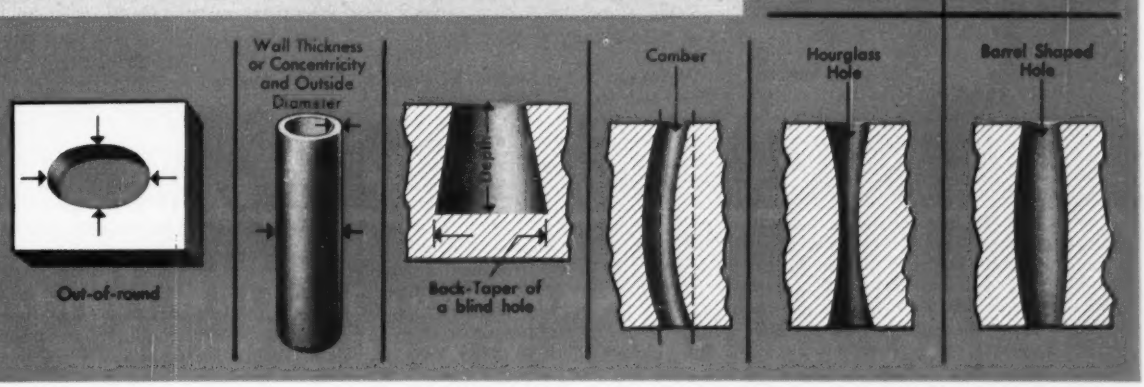
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Obituaries

Wallace T. Montague

Wallace Tenney Montague, vice-president of the Norton Co., Worcester, Mass., died suddenly on July 30, at the age of sixty-three years. Mr. Montague was a native of Worcester and was graduated from the



Wallace T. Montague

Worcester Polytechnic Institute in 1912. He then began work for the Norton Co. in the research laboratory. In 1916, he was appointed head of the sales engineering department, and was made assistant sales manager of the Abrasive Division three years later. After various promotions in the years to follow, he became vice-president and manager, Business Planning and Development, in 1942, the position he held at the time of his death. Mr. Montague was a director of the Grinding Wheel Institute and former board chairman of both the Grinding Wheel Manufacturers Association and the Abrasive Grain Association. He was associated with the Norton Co. for forty years, and was well known throughout the abrasive industry.

E. W. CLEVELAND, vice-president and special sales representative of the Cleveland Pneumatic Tool Co., Cleveland, Ohio, was killed on August 7 when the airplane he was piloting crashed on Mt. Baldy, near Seattle, Wash. Mr. Cleveland joined the company in 1927, and made his home in Berea, Ohio. He traveled widely in his work, as well as in following his great interest in aviation. Mr. Cleveland made his first solo flight in 1912, and was the nation's oldest active pilot. He is survived by his son, Lewis F. Cleveland.

HERMAN BERG, superintendent of the Kelly Reamer Co., Cleveland, Ohio, died on August 18 at the age of sixty-two years. Mr. Berg was superintendent of the company for a period of twenty-seven years.

Coming Events

SEPTEMBER 8-10 — THIRD NATIONAL STANDARDIZATION CONFERENCE sponsored by the American Standards Association in Chicago, Ill. Headquarters, Museum of Science and Industry. Further information can be obtained by writing to the Association at 70 E. 45th St., New York 17, N. Y.

SEPTEMBER 8-12—Seventh National Instrument Conference and Exhibit of the INSTRUMENT SOCIETY OF AMERICA at the Public Auditorium, Cleveland, Ohio. For further information, address the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa.

SEPTEMBER 30-OCTOBER 3—1952 IRON AND STEEL EXPOSITION sponsored by the Association of Iron and Steel Engineers, to be held at the Public Auditorium, Cleveland, Ohio. For further information, write to the Association, 1010 Empire Bldg., Pittsburgh 22, Pa.

OCTOBER 20-24 — NATIONAL METAL EXPOSITION AND CONGRESS at the Philadelphia Convention Hall, Philadelphia, Pa. Secretary, W. H. Eisenman, American Society of Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 26-29—Semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill. Executive Secretary, J. C. SEARS, 302 Empire Bldg., Pittsburgh 22, Pa.

OCTOBER 29-31—FIFTH ANNUAL MACHINE TOOL CONFERENCE of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS at the Hotel Ten Eyck, Albany, N. Y. Additional information can be obtained by writing to J. M. Delfs, Chairman, A.I.E.E. Machine Tool Sub-committee, c/o General Electric Co., Schenectady 5, N. Y.

NOVEMBER 5-7 — Sixteenth Annual Time and Motion Study and Management Clinic sponsored by the INDUSTRIAL MANAGEMENT SOCIETY at the Sheraton Hotel, Chicago, Ill. Further information can be obtained by addressing the Society, 35 E. Wacker Drive, Chicago 1, Ill.

NOVEMBER 19—Thirty-fourth annual meeting of the AMERICAN STANDARDS ASSOCIATION at the Waldorf-Astoria in New York. Headquarters of Association, 70 E. 45th St., New York 17, N. Y.

NOVEMBER 20-21—Seventh Mid-West Conference of the AMERICAN SOCIETY FOR QUALITY CONTROL at the Claypool Hotel, Indianapolis, Ind. For further information, address Dale A. Cue, 5565 Brookville Road, Indianapolis, Ind.

DECEMBER 1-6—Twentieth National Exposition of Power and Mechanical Engineering at the Grand Central Palace, New York City, under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Executive assistant secretary, Ernest Hartford, 29 West 39th St., New York 18, N. Y.

* * *

Apprenticeship Bureau Will Aid Sponsors in Certifying Programs

W. F. Patterson, director of the U. S. Department of Labor's Bureau of Apprenticeship has announced that facilities of the Bureau's field offices are being made available to sponsors of apprentice training programs who wish to certify their programs under the recent Presidential order authorizing requests for the deferment of apprentices who meet Selective Service regulations. In requesting acceptance of apprentice training programs for deferment purposes, sponsors must make application to their respective state directors of Selective Service, certifying that their programs conform to all Selective Service requirements and standards governing the deferment order.

Forms for requesting acceptance of apprentice training programs, as well as assistance in processing requests, may be obtained by those sponsors whose programs qualify under the deferment order from field representatives of the Bureau of Apprenticeship, representatives of state apprenticeship agencies, or state directors of Selective Service.

To be eligible for acceptance, apprentice training programs must, among other requirements, have been in existence at least one year; one or more apprentices must have been continuously employed during this time in each occupation for which request is made; and the occupations in which they have been employed must conform to requirements for those occupations prescribed in the order.

* * *

Production per man is now five times what it was at the beginning of the century. The answer, says the Chamber of Commerce of the United States, is to be found largely in the increased use of machinery that speeds production. Such machinery requires heavy capital investment and such investment can come only out of earnings.

SIDNEY LATHES

ARE JUST RIGHT FOR YOUR

LARGER TRACER

JOBS, TOO

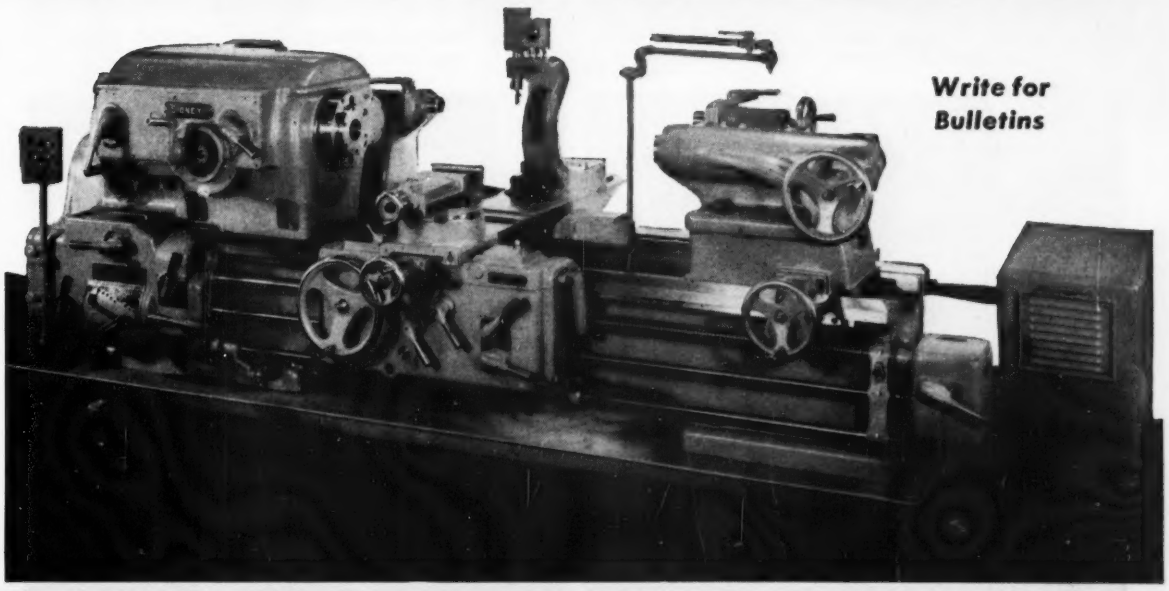
25" TRACER LATHE RAISED TO SWING 33½"

SIDNEY LATHES OFFER THE PERFECT COMBINATION OF RUGGEDNESS & SENSITIVITY

RUGGEDNESS AND BRUTE STRENGTH . . . for heaviest cuts and to withstand the most severe strains, power transmitting elements are made of unusually large proportions of finest, heat treated and hardened materials.

DELICATE SENSITIVITY . . . the Sidney FLUID TRACER permits unlimited reproduction, true to form in every detail.

SIDNEY LATHES ASSURE FAST, ECONOMICAL PRODUCTION EVEN ON TOUGHEST TYPES OF WORK



Write for Bulletins

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904

Special Tools Developed to Machine Long Taper Bores

Producing a long taper bore on heavy parts has always been a difficult and expensive machining process, requiring several operations. A high degree of accuracy is necessary, especially when bores are required to fit bushings of mating parts. The Henry & Wright Division of Emhart Mfg. Co., Hartford, Conn., has successfully solved this problem by using a specially designed multiple-cutter roughing bar, shown in the upper view, Fig. 1, and a floating taper cutter held in a special bar shown in a similar view, Fig. 2. These tools were designed and made by the Madison Mfg. Co., Muskegon, Mich. They eliminate the individual turning and hand fitting of each bushing which were necessary when using the cam type boring-bar previously employed. They also reduce the number of tool passes to two.

In using the tools shown, the work remains stationary while the tool-bars revolve. The multiple-cutter roughing bar step-bores the casting as shown in the lower view, Fig. 1. The floating taper cutter held in a special bar then finish-reams the stepped bore to size. The floating action of the cutter produces the accurately sized and tapered hole required, while the two-blade principle insures a good finish and eliminates the possibility of chips scoring the surface.

By changing over from a cam controlled type of boring-bar to the tools illustrated, the manufacturer saves over eighteen hours in machining and hand fitting time on each frame for one of its dieing machines.

* * *

Second Edition of Parker-Kalon Engineering Standards

The Parker-Kalon Corporation, New York City, has recently released the second edition of "Engineering Standards." Complete dimensions are given for all sizes and styles of self-tapping screws, patch bolts and welding studs, and for socket-head machine screws, thumb-screws, wing-nuts, screw-nails, masonry nails, socket-head pipe plugs, and hexagon keys.

All of the above thread forms, as well as the various head designs, are suitably illustrated. In addition, many non-standard forms and head designs of self-tapping screws are shown. Government specification numbers for all screws are listed.

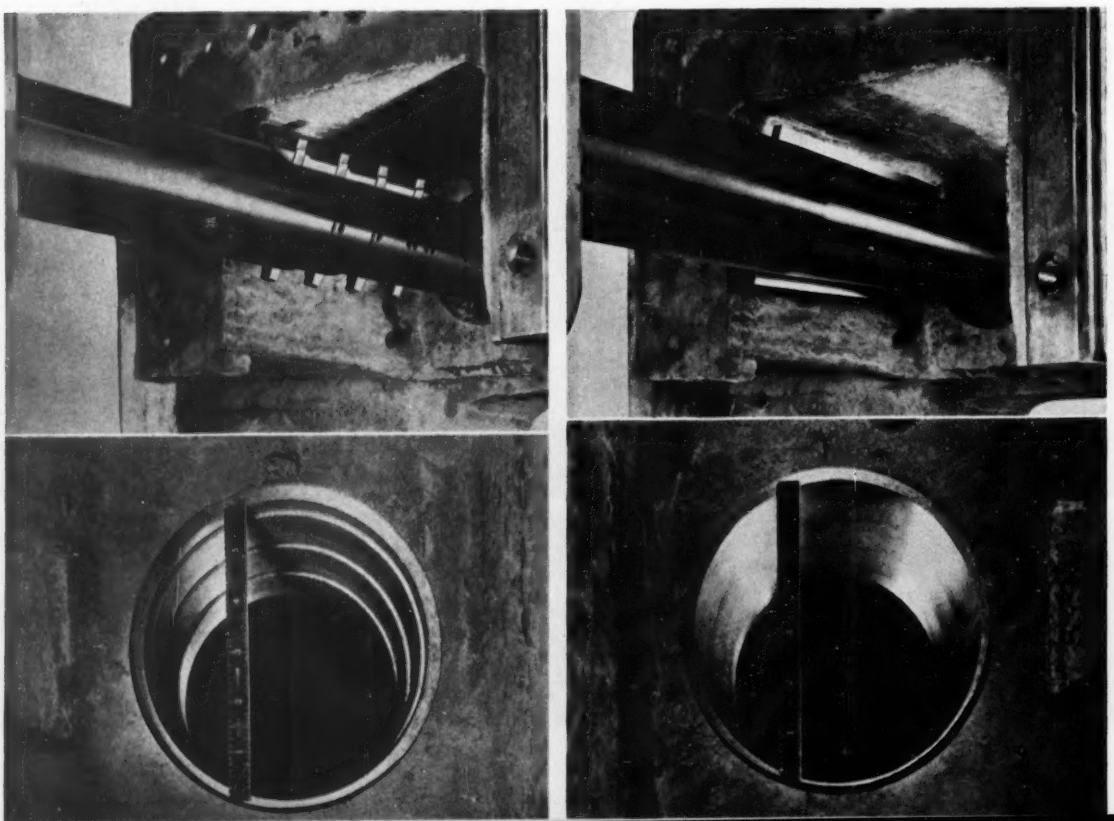
* * *

How Small Plants Can Sell to the Government

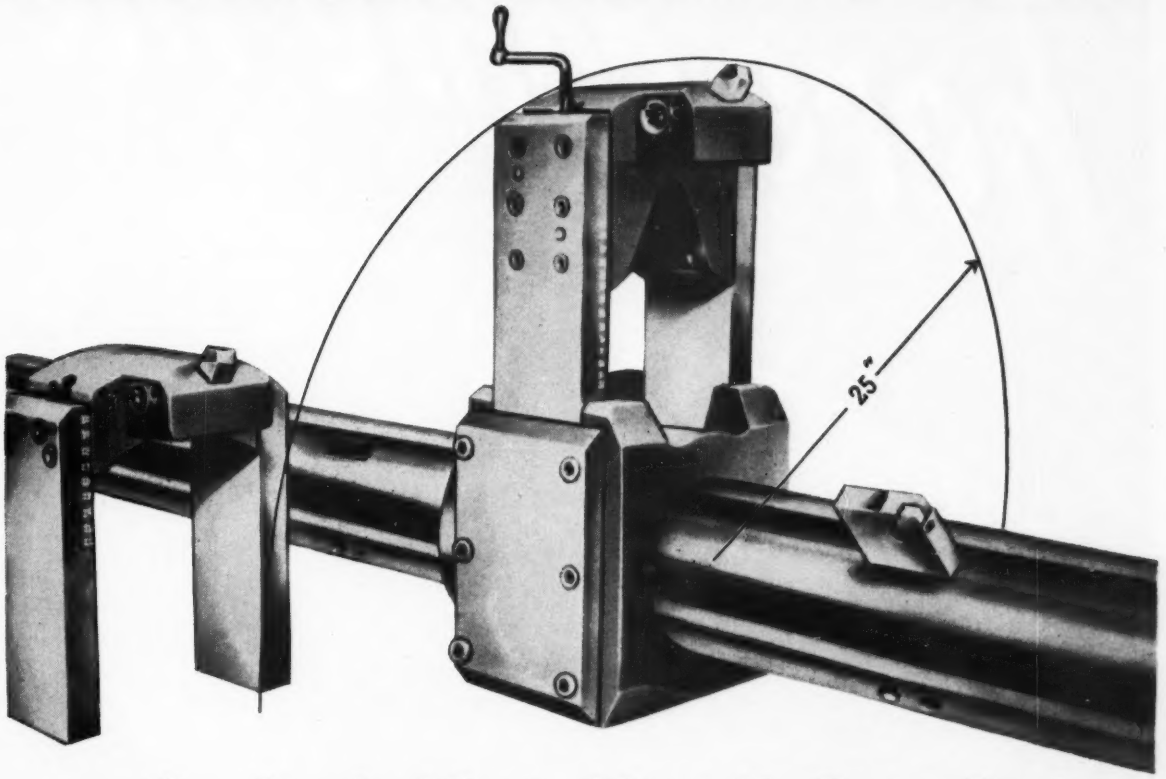
A leaflet designed to help the small manufacturer sell his products to the Government is now available from all SDPA field offices and the Washington, D. C., office, according to an anouncement of the Small Defense Plants Administration. Entitled "How Small Plants Can Sell to the Federal Government," it is the first in a series of helpful leaflets to be issued by SDPA. The steps in seeking information regarding the agencies which may be in the market for a manufacturer's products are outlined.

Fig. 1. Multiple-cutter rough-boring tool (upper view) designed to produce step-bored hole (lower view)

Fig. 2. Floating taper cutter (upper view) which finishes step-bored hole to size (lower view)



NOW ACCURATELY BORE DIAMETERS FROM 10" TO 50"

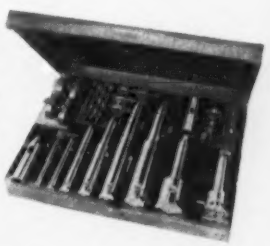


with a Standard Davis Adjustable Boring Head

You don't have to buy custom-made heads for your large diameter boring any more. Standard Davis Extension Heads — micrometer adjustable for any bore from 10" to 50" — take care of those large miscellaneous jobs on horizontal boring machines.

Super micrometer construction assures positive accuracy — allows you to make accurate adjustments on several cuts taken on the same bore. The head is held rigidly in place by a key that fits the line boring bar. A hand crank adjusts the arms of the boring head with a screw and nut arrangement. After the adjustment has been made, the arms are clamped positively by six screws on the clamp plate.

Here you have the finest accuracy possible in extension boring heads — now available as a standard item with your nearest Davis representative. Call him — or write us direct for full information on this versatile attachment.



Davis Stub Boring Tools Speed Up Boring Operations on Vertical and Horizontal Boring Machines

Available in sets consisting of precision made stub boring bars that are accurate to .0001" fine adjustment. Range from ½" to 7" dia.

DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY • Fond du Lac, Wisconsin

Manufacturers of: **TABLE, FLOOR AND PLANER TYPE HORIZONTAL BORING, DRILLING AND MILLING MACHINES • VERTICAL BORING AND TURNING MILLS • DOUBLE HOUSING AND OPEN SIDE PLANERS AND PLANER TYPE MILLING MACHINES • COMPLETE TOOLING SERVICE**


here come the

new MICHIGAN ULTRA-SPEED HOBBERS

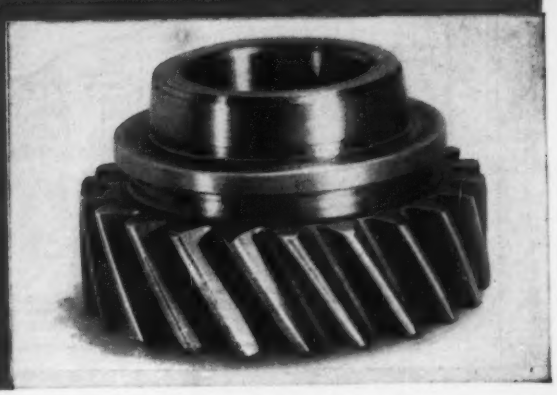
Now in production, rounding out the complete line of gear production machines and tools designed and produced by Michigan Tool Company—

Gear Production Headquarters.

For details on production models of this versatile new single-spindle hobber, write for Bulletin #1458-52.

MICHIGAN TOOL Company

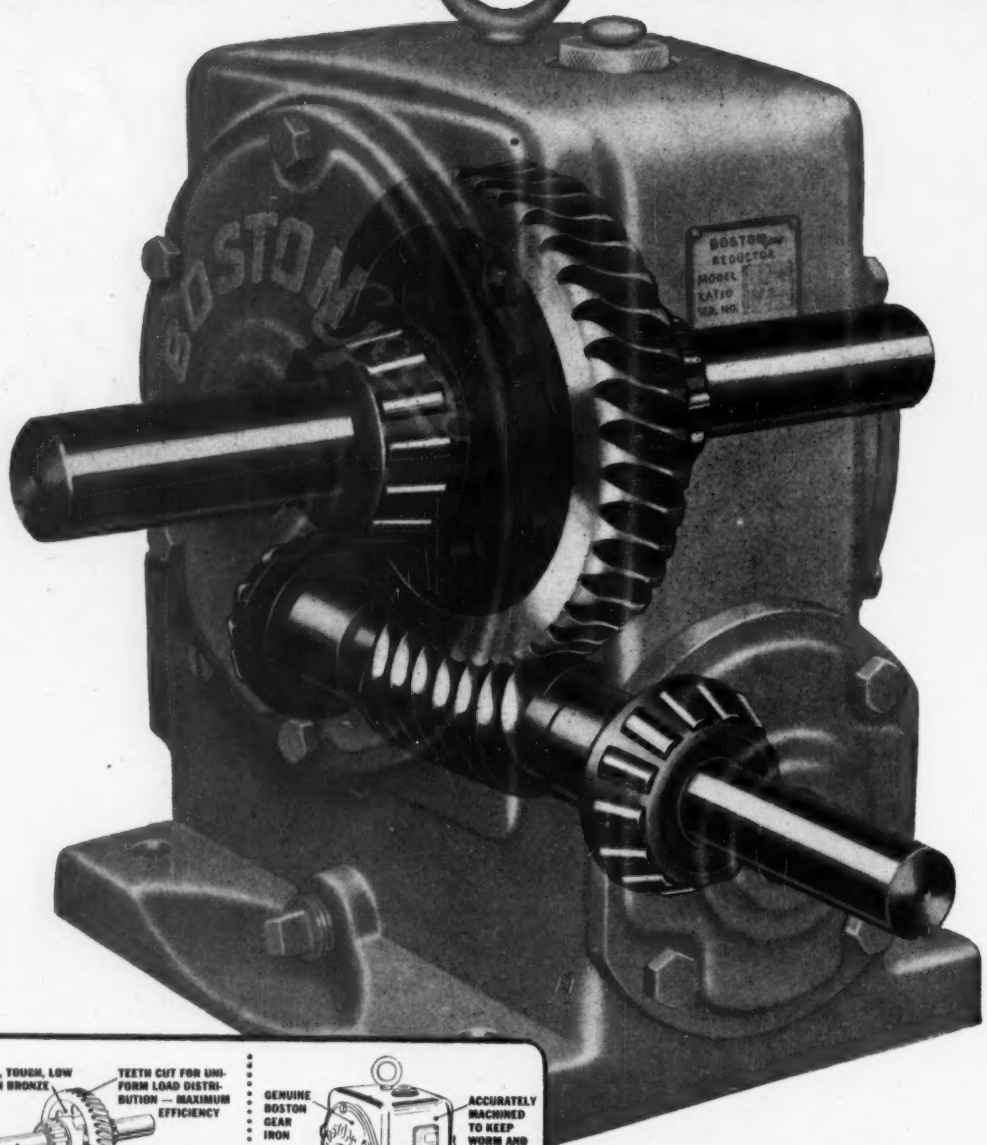
7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

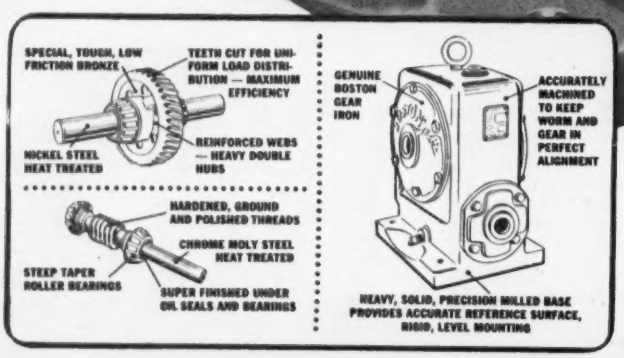


930 of these gears are produced on two of these single spindle Michigan Hobbers on an 8 hr. shift as compared with 825 on an 8 spindle hobber.

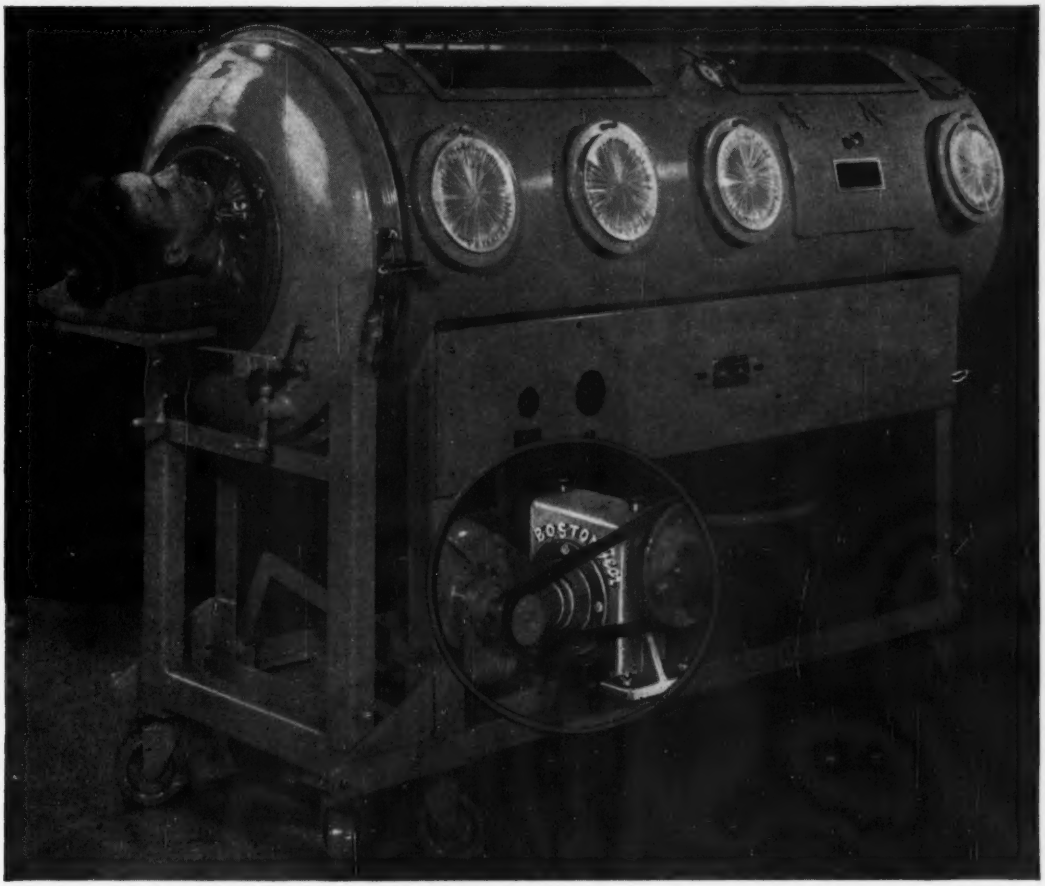
Sure BOSTON REDUCTORS Cost More

LOOK WHAT YOU GET





The highest efficiency
SPEED REDUCER
by actual test



IRON LUNG Company of America says: "We have used Boston Reductors on all of our respirators since 1936. These standard stock units have driven Iron Lungs over long periods of time, continuously, without breakdown. So long as their high standard of quality and workmanship continues, we shall continue to use Boston Reductors."

IN STOCK NEAR YOU

BOSTON REDUCTORS are ready for instant delivery at any of these Authorized Boston Gear Distributors.

Ask for a comparative demonstration.

AKRON
Bearing Distributors, Inc.
ALBANY
Sager-Spuck Sup. Co.
ALLENTOWN
Wm. H. Taylor & Co., Inc.
ATLANTA
Boston Gear Works
J. M. Tull Metal & Sup. Co.
BALTIMORE
Carey Mchy. & Sup. Co.
BIRMINGHAM
Owen-Richards Co., Inc.
BOSTON
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BROOKLYN
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BUFFALO
Root, Neal & Co.
CHARLESTON, W.VA.
Baldwin Supply Co.
CHARLOTTE
Matthews-Morse Sales Co.
CHATTANOOGA
Volunteer Bearing & Transmission Co., Inc.
CHICAGO
Boston Gear Works*
Chgo. Pulley & Shafting Co.
Samuel Harris & Co.
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COLUMBUS
Ohio Trans. Co.
DALLAS
Geo. J. Fix Co.
DAYTON
Klinger-Dills
DENVER
Western Belting & Packing Co.
DES MOINES
Standard Bearings Co.
DETROIT
Boston Gear Works
Chas. A. Strelinger Co.
EVANSVILLE, INDIANA
Bearings Service Co., Inc.
GRAND RAPIDS
Mackay Industrial Sales Co.
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Trans. Supplies, Inc.
HAMILTON, ONTARIO
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HARTFORD
Silliter-Holden, Inc.
HOUSTON
Boston Gear Works
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INDIANAPOLIS
Vonnegut Hardware Co.

JACKSONVILLE
S. B. Hubbard Co.
KANSAS CITY, MO.
Elfeldt Mchy. & Sup. Co.
KNOXVILLE
Hoyt N. Payne Co.
LANCASTER
Herr & Co., Inc.
LONDON, ONTARIO
Renold-Coventry, Ltd.
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L. C. Biglow & Co., Inc.
LOS ANGELES
Andrews Hardware & Metal Co.
Boston Gear Works
Garrett Supply Co.
LOUISVILLE
Industrial Equip. Co.
MEMPHIS
Lewis Sup. Co
MIAMI
Gondas Corp.
MILWAUKEE
Boston Gear Works
Western Iron Stores Co.
Wisconsin Bearing Co.
MINNEAPOLIS
R. C. Duncan Co.
Industrial Supply Co.
MONTREAL, QUEBEC
Renold-Coventry, Ltd.
NEWARK
Squier, Schilling & Skiff, Inc.
NEW ORLEANS
McLellan Equipment Co.

NEW YORK CITY
L. C. Biglow & Co., Inc.
Boston Gear Works*
Hansen & Yorke Co., Inc.
Frank Tracy, Inc.
OAKLAND
C. W. Marwedel
PHILADELPHIA
Boston Gear Works*
Lindsay, Oberholzer & Co.
Maddock & Company, Inc.
PITTSBURGH
Boston Gear Works
Somers, Fitler & Todd Co.
PORTLAND, ORE.
J. E. Haseltine & Co.
PROVIDENCE
Machine Parts Corp.
QUEBEC, QUEBEC
Renold-Coventry, Ltd.
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RICHMOND
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Calcord-Wright Mchy. & Sup. Co.
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Boston Gear Works*
C. W. Marwedel

SEATTLE
Cragin & Co.
SOUTH BEND
Bearings Service Co., Inc.
SPRINGFIELD, MASS.
Boston Gear Works*
Standard Industrial Supply Co., Inc.
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Syracuse Sup. Co.
TAMPA
Southern Pump & Sup., Inc.
THREE RIVERS, QUEBEC
Renold-Coventry, Ltd.
TOLEDO
Ohio Belting & Trans. Co.
TORONTO, ONTARIO
Renold-Coventry, Ltd.
TRENTON
Lindsay, Oberholzer & Co.
UTICA
Boston Gear Works
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Renold-Coventry, Ltd.
WALLINGFORD
Transmission Equipment Co., of Conn., Inc.
WATERBURY
White Supply Co.
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Holmes Metallic Co.
WINSTON-SALEM
Foster Machinery Co.
WORCESTER
W. M. Steele Co.

*Branch office and stock

BOSTON GEAR WORKS 65 HAYWARD ST., QUINCY 71, MASS.

Ask Yourself:

1 ***Do we have hand operations that could be mechanized?***

2 ***Is inferior mechanization hampering any operation?***

3 ***Can we use a greater degree of automatic control?***

4 ***Could we combine several operations into a continuous process?***

If your answer is yes, then you are not producing as fast and efficiently as you can

. . . and the immediate importance of your answer is this: from now on, your success as a manufacturer will depend more and more upon the degree of mechanization in your plant.

Too often, today, advances in mechanization are confined to breaking a production bottleneck, or matching a competitive process.

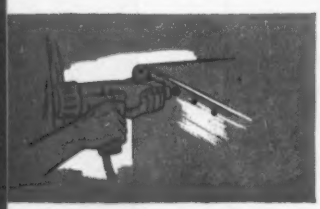
Let's look a bit further—at replacing these sporadic improvements with a *planned* mechanization program.

The results are cumulative. Progressively, each operation is lifted to a higher level of mechanization on a sound economic schedule.

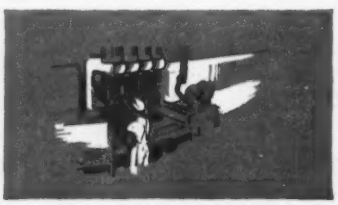
You are insured against tomorrow's competition. Manpower and scarce materials are conserved. Your profit position is strengthened.

To help you plan your mechanization, General Electric offers a new guide. We call it "Progressive Mechanization." It's a "More Power to America" program—another way to increase industrial productivity by spreading the knowledge of modern industrial techniques.

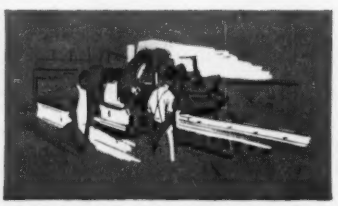
HERE ARE THE FOUR STAGES OF PROGRESSIVE MECHANIZATION



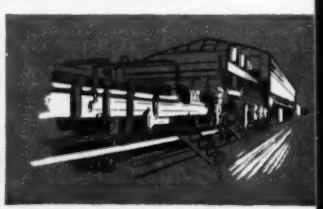
1 **Simple Mechanization**—simple machines driven by power—like this electric tool.



2 **Improved Mechanization**—more complex, like this drilling machine. Motors and controls aid manual operations.



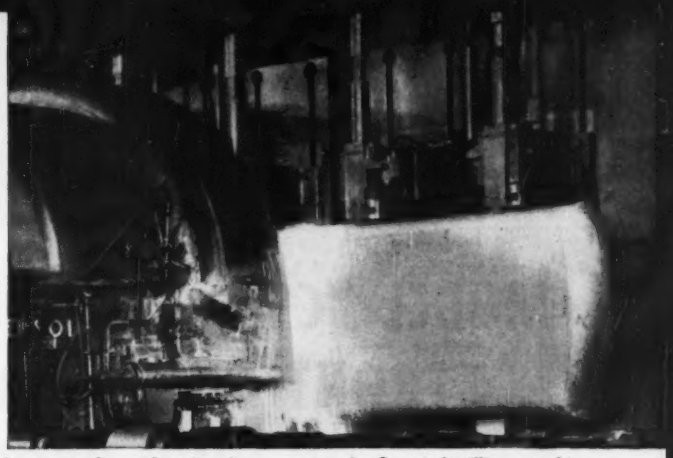
3 **Automatic Control**—machines that have adjustable-speed with "push-button control," like an automatic welder.



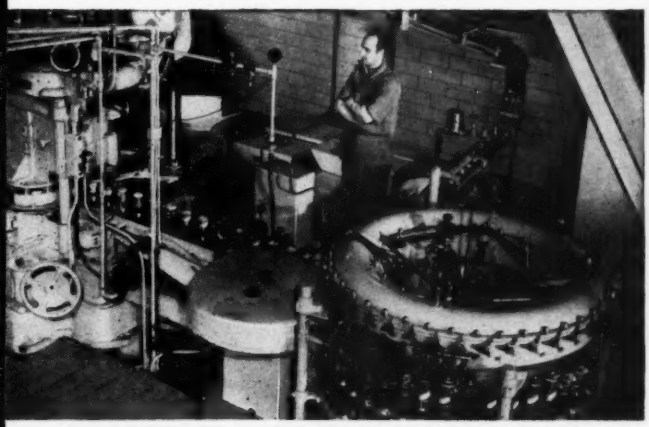
4 **Continuous Process**—machines co-ordinated for "start-to-finish" production.



Simple mechanization—example: Lightweight electric impact tool tightens nuts in 1/10 the time a hand wrench takes.



Improved mechanization—example: Special milling machine replaces lighter type—"scalps" aluminum billets 5' wide 10' long.



Automatic control—example: Adjustable-speed beer-can filling machine will change rate of production to meet any condition.



Continuous process—example: 216 operations are made on cylinder block in 36 seconds by automatic-transfer-type machine.

How you can improve production in your plant with the G-E Progressive Mechanization Program

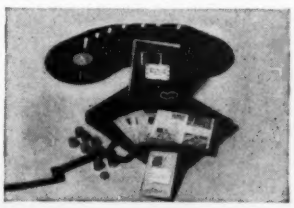
START OFF with a "launching ceremony"—have all of your engineers and key people see the full-color movie "Motors in Industry." You'll drive home to them the importance of improving mechanization in your plant.

This informative film has more than 40 interesting mechanization case histories. Shots from four of them are pictured above. They are just a few of the examples that you can use to stimulate interest in mechanizing *progressively*.

CHANNEL THIS INTEREST—do some practical, organized probing into your present production methods. General Electric's Progressive Mechanization manual may help show you the way. Hand out the special mechanization survey forms. You can use them to enlist the participation of as many persons as you wish, including the men "at the bench."

WANT TO LEARN MORE? You get a free copy of the Progressive Mechanization manual, and indicate interest in seeing "Motors in Industry," just by sending in the coupon below. Or contact your nearest G-E Apparatus Sales Office.

GENERAL ELECTRIC



Back up your Mechanization Program with the G-E Motor Selection Course

Here's a complete course, covering the fundamentals of motors now available. It explains how to select and supply motors, what sort of control to use. Your local G-E representative can make arrangements for you to use this course.

MORE POWER TO AMERICA programs are guides to increase the efficiency of American Industry. They stimulate wider, more efficient use of electricity in production.



Section C752-14
General Electric Co., Schenectady 5, N. Y.

I'd like to learn more about the new G-E Progressive Mechanization program.
I'm interested in:

- ☐ A *free* copy of the Progressive Mechanization manual.
- ☐ Seeing the motion picture on Progressive Mechanization.
- ☐ Using the "Motor Selection & Application Course."

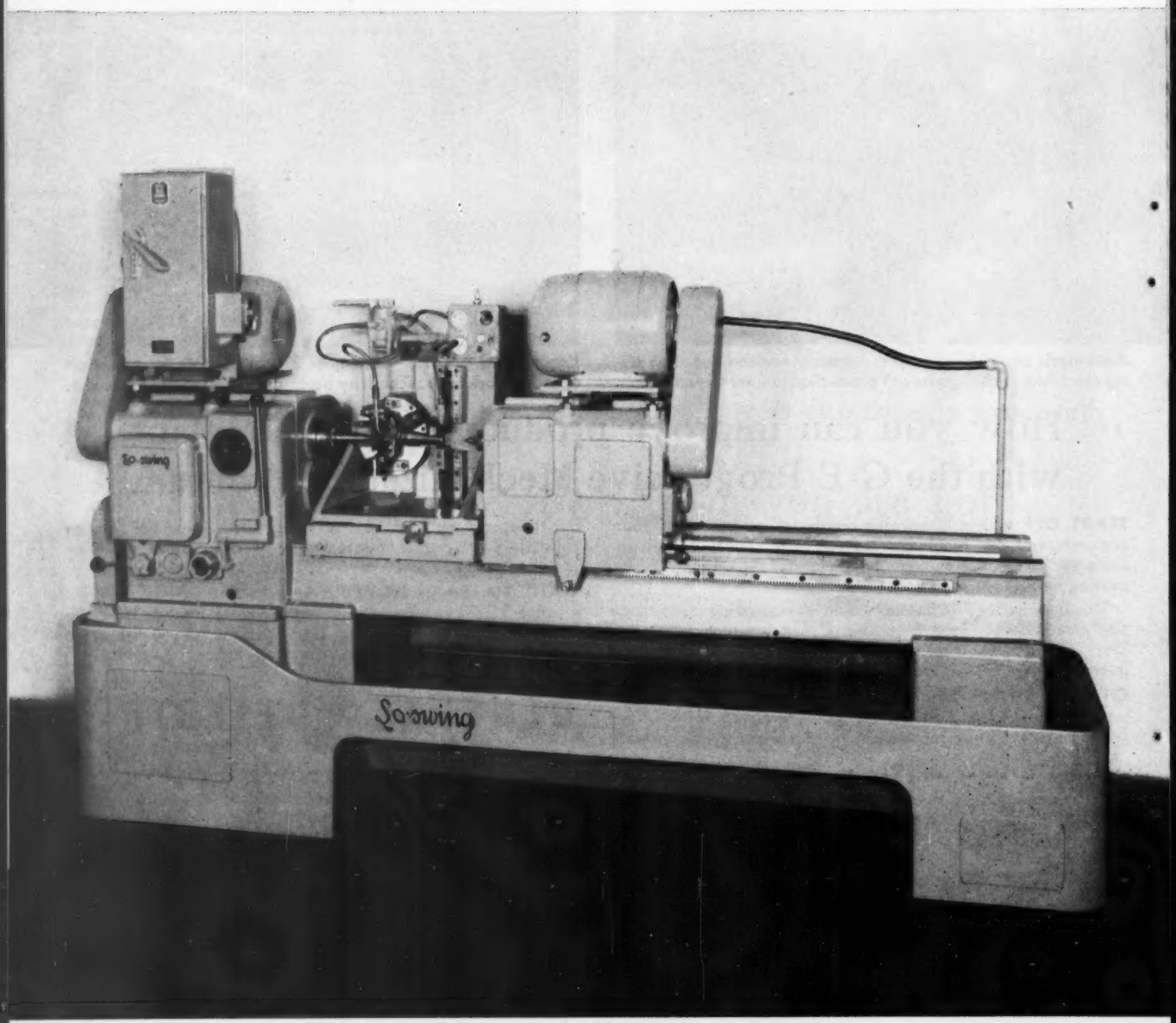
Name..... Title.....

Company.....

Address.....

MACHINE OF

MODEL "CS" CENTERING MACHINE CENTERS FRONT WHEEL PIVOTS ACCURATELY, ON HIGH PRODUCTION BASIS



PRODUCTION COSTS

THE MONTH

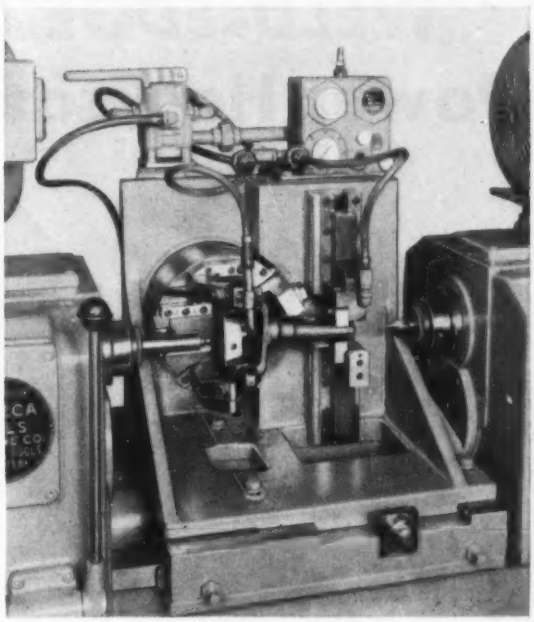
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *So-swing* PEOPLE" SENECA FALLS, NEW YORK

LEFT: General view of Model CS Centering Machine equipped for centering front wheel pivots.

Problem: To center both ends of front wheel pivots without distorting the stem end.

Solution: The standard Model CS Centering Machine equipped with a special work holding fixture was selected for this job. The work comes to the machine as a rough forging without any previous machining. The work holding fixture consists of a special round chuck mounted on a spindle yet free to revolve a few degrees on each side of the center line. This prevents any bending of the part when the 2-jaw vise closes on its small end. The chuck and vise jaws are operated with separate air cylinders installed on the rear of the fixture and controlled by a 4-way air valve.

The operator places the rough forging in a loading cradle, against a spring-loaded V-block, which positions it in relation to the opening between the lugs at the large end. The air valve is then operated and the large threaded stud, fitted to the inclined



ABOVE: Close up view of special work holding fixture.

air-operated cross slide, forces the part back into the stationary V-blocks. A second movement of the air valve closes the 2-jaw air-operated vise. Starting handle is then positioned forward and the machine goes through its cycle automatically. Both ends are centered simultaneously.

Seneca Falls engineers welcome inquiries involving difficult machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

ARE LOWER WITH *So-swing*

NEW!

SIMONDS "WELD-EDGE" Power Hacksaw Blade

It's Shatterproof!





BEND IT . .

TWIST IT . . .

DROP IT . . .

STEP ON IT . . .

IT'S TOUGH . . .
AND LONG-LASTING!



HAMMER IT

Here's a Power Blade especially designed to meet all plant safety and performance requirements. A blade so tough it will not snap in operation regardless of abuse, neglect, worn machine condition or improper adjustment. A blade that has a high speed steel cutting edge that resists wear and is adaptable for all types of cutting.

With "Weld-Edge" there will be fewer blade-changes, longer blade life. This means more cuts per blade, higher output per machine and a definite reduction in production costs.

So for safety, dependability and increased output at lower cost, get SIMONDS "Weld-Edge" Blades from your Industrial Supply Distributor. All standard sizes available from stock.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.
Southern Service Shop in Meridian, Miss. (formerly J. H. Miner Saw Mfg. Co.)
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

Practical Assistance



Whether it's a tight squeeze in a cookie jar or a bottleneck on your production line . . . practical assistance—the kind that solves the problem simply and fast—is your best answer. And ***PRACTICAL TECHNICAL ASSISTANCE*** is a *Cities Service specialty*.

Cities Service Lubrication Engineers can offer *practical assistance* that will eliminate bottlenecks caused by faulty lubrication . . . will mean dollars, man-hours and equipment saved. They're specialists in the industry's most effective lubricating practices. In addition, they offer the most complete line of Cities Service quality lubricants.

but check for yourself:

✔ Check on the high quality of all Cities Service lubricants. Ask critical users. Or better still, test them on the job.

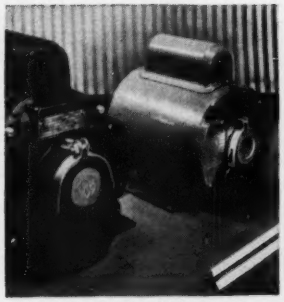
✔ Check the complete Cities Service line for the correct lubricant for every need. Deliveries are quick—and dependable.

✔ And finally, discuss your problems with a Cities Service Lubrication Engineer . . . he's probably solved many like them for other machine operations. Write or phone CITIES SERVICE OIL COMPANY, Dept. 118, Sixty Wall Tower, New York City 5 . . . or get in touch with the office nearest you.

CITIES SERVICE

Designer's

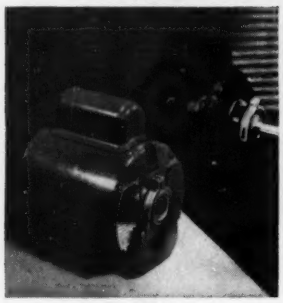




It's smaller . . .



lighter . . .



better looking . . .



more versatile!

All-new G-E fhp motor opens up new ways to improve your product

Now—with this radically new line of General Electric Form G fractional-horsepower motors—you can free yourself of former limitations, design new and more saleable features into your products. More easily and at less cost, too!

Smaller size and lighter weight let you put power into minimum space, cut storage and transportation costs, make installation and handling easier. Functional design aids your product's appearance. And all-angle operation often permits use of this general-purpose motor in place of more costly specials.

The new G-E Form G embodies an entirely new concept of motor design and brand-new features that make it quieter, tougher, easier to use, and longer-lasting. Check Bulletin GEA-5567. General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

Digest

PRODUCT HIGHLIGHTS

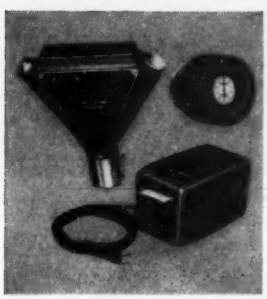
BUILD IN A STANDARD G-E MOTOR TO FIGHT DIRT AND CORROSION



Both types of G-E Tri-Clad* totally-enclosed motors—the fan-cooled (shown) and the non-ventilated—are standard, "off-the-shelf" motors. That means these integral-hp motors are easier to order, cost less, can be shipped faster. They have all the protective features needed for machines that operate in atmospheres containing dirt, oil, or metallic dust. See Bulletin GEA-4400.

Reg. Trade-mark of General Electric Company

VIBRATION-MEASURING EQUIPMENT HELPS YOUR QUALITY CONTROL



Keep vibration within allowable limits as a quality-control aid with one of these G-E vibration-measuring instruments. Shown are (top right) general-use dial-type indicator; (left) more accurate light-beam-type unit; and recording vibrometer. For full data on these valuable development and inspection tools, check Bulletin GEC-853.

NEW G-E BOOKLET SIMPLIFIES YOUR SELECTION OF CONTROL COMPONENTS

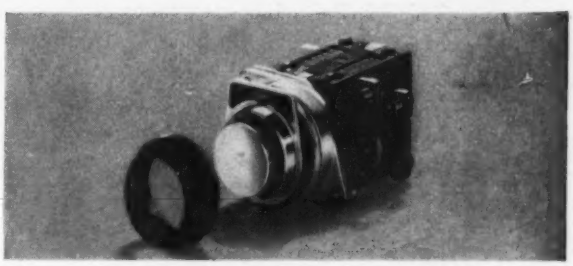


Here's a valuable new addition to your reference file that quickly summarizes the highlights on a wide variety of G-E motor starters, control accessories, and electronic devices. For each of the many components covered, the booklet gives ratings, features, typical applications; also lists available bulletins containing more detailed information. See new Bulletin GEA-5781.

New push-button units high in color-coding flexibility

Machinery manufacturers can change push-button coding colors quickly and easily when they stock the new G-E oiltight push-button line. Simply switch the detachable color ring—and that's all—when you want to change color. Replacing entire units to vary color identification is unnecessary. For maximum flexibility, these rings are available in five colors: black, red, green, yellow, and white. Unit costs are lowered—so is the size of your inventories.

These new units also feature one basic type of contact block, and a variety of interchangeable operators. This "building-block" flexibility makes it possible to assemble the right unit for any design need. And because all of these components are standard, you'll get faster shipment. See Bulletin GEA-5779.



General Electric Company, Section D-668-95
Schenectady 5, New York

Please send me the following bulletins

√ for reference purposes
X in connection with immediate projects

- ☐ GEA-4400 Tri-Clad Motors
- ☐ GEA-5567 Form G Fhp Motors
- ☐ GEA-5779 Push-button Units
- ☐ GEA-5781 Control
- ☐ GEC-853 Vibration-measuring Equipment

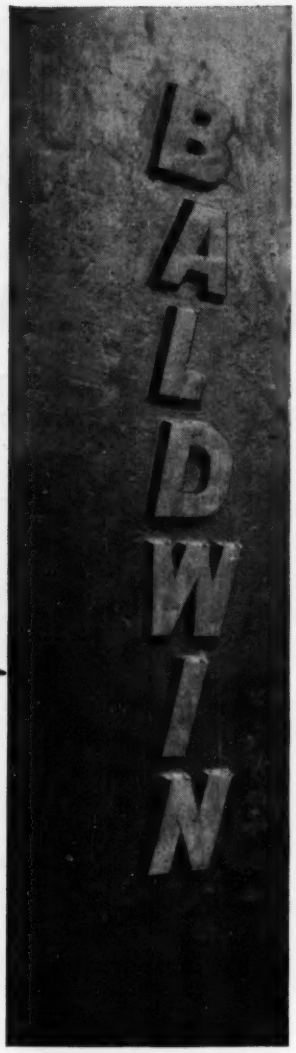
CONSULT YOUR McGRAW-HILL ELECTRICAL CATALOG FOR PRODUCT ENGINEERS! You'll find "everything electric" for machinery manufacturers in the General Electric section.

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...unique Compound Head cuts costs at Wyatt's

This *big* Baldwin plate planer at the Houston plant of Wyatt Metal and Boiler Works is a real cost-cutter with its versatile compound head and quick reversing action. The head can be hand fed through any angle from 30° below to 105° above the horizontal center. The tools have a 10″ horizontal travel and 9″ vertical travel. This combination of large linear travel and angular adjustment enables Wyatt to easily scarf and angle-finish plate edges without removal and turning of plate.

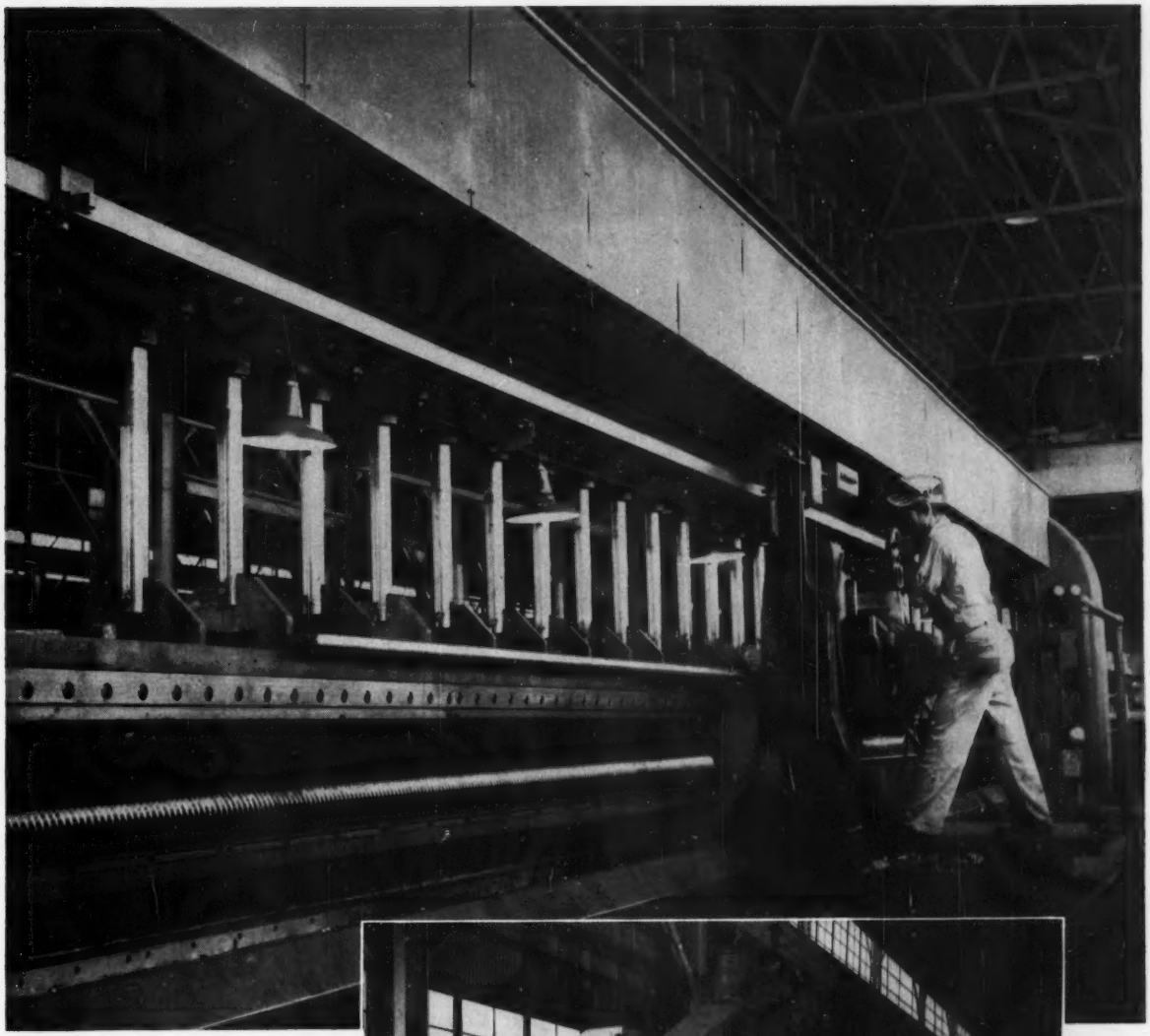
Since its installation, Wyatt has been able to appreciably reduce the time required to bevel steel plate and has made substantial reductions in their production costs.

If you are in the market for either a standard or special plate planer —or any type of mechanical or hydraulic press—contact your nearest Baldwin representative. For more than 100 years we have been designing and building large, close tolerance equipment for the metal working industry. You'll find this experience invaluable in helping you to select equipment that will exactly do your job —and do it with maximum efficiency and satisfaction.

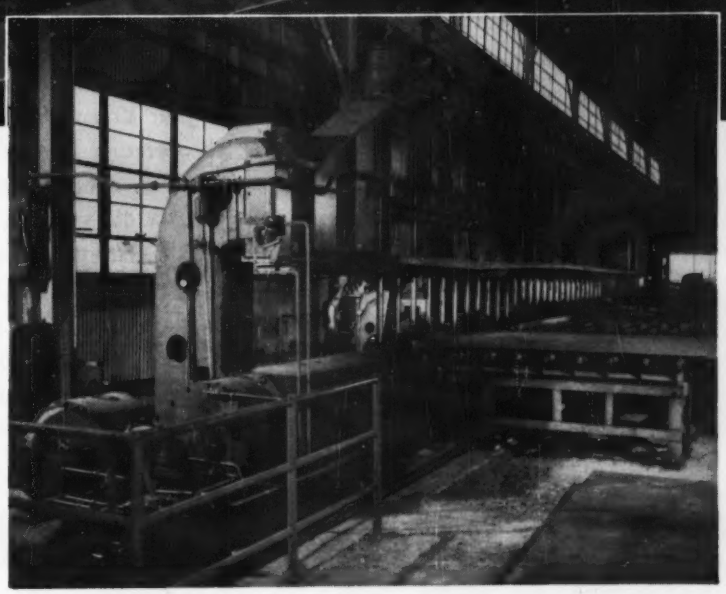
BALDWIN BLH LIMA-HAMILTON

Eddystone Division
BALDWIN-LIMA-HAMILTON CORP.
Philadelphia 42, Pa.
Offices in Principal Cities

BALDWIN - LIMA



63 feet in overall length, this Baldwin planer machines plates up to 40 feet long. Cylinders can be used in groups to minimize air consumption. Maximum clamping pressure is 270,000 pounds.



Speed of carriage is adjustable from 15 feet to 60 feet per minute. Reversing is smooth and easy because of dynamic braking that slows down and reverses motor at the end of each stroke. Solenoids lift toolholders on the back stroke to prevent tool drag.

-HAMILTON



View of Quick-As-Wink Hydraulic Valve Installation in Steel Mill

Quick-As-Wink Control Valves



smooth month-after-month performance

minimizes your down-time

● Gambling with breakdowns, lost production and plant tie-ups just doesn't pay. Play safe! Install Quick-As-Wink Valves on *all* your air and hydraulic controls. Positive and fast acting, all operating parts of Quick-As-Wink Valves are in pressure balance, eliminating any tendency to creep or crawl. Quick-As-Wink Valves can be serviced easily and quickly, during normal maintenance periods, usually without disturbing connecting piping. There is no metal to metal seating. All parts are standardized and readily interchangeable, avoiding the delay of returning valves to the factory for servicing, and the expense of maintaining large standby inventories. Standardize on Quick-As-Wink — and get *all* the advantages that *only* Quick-As-Wink Valves can give you.

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves

Hand, Foot, Cam, Diaphragm and Solenoid Operated

***Mfd. by* C. B. HUNT & SON, INC., 1911 East Pershing St., Salem, Ohio**

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS
See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Greer Hydraulics, Inc., 452 18th St., Brooklyn 15, N. Y.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Watson-Stillman Co., Roselle, N. J.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY-STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOYS, Aluminum
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Magnesium
Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor.

ARBORS AND MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

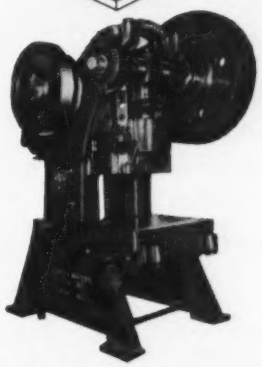
BABBITT
Bunting Brass & Bronze Co., Spencer & Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Pope Machinery Corp., Haverhill, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 280)

JOHNSON

Bonus Built
POWER PRESSES

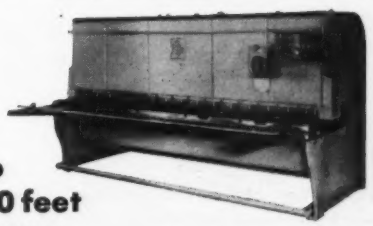


15 MODELS
16 to 90 TON CAPACITY
RUGGED
DEPENDABLE
TIME - TESTED

WRITE FOR SPECIFICATIONS

new . . . different and better *the* **HYDRA-SHEAR**

JOHNSON HYDRA-SHEAR



3 MODELS — to shear 6 - 8 - 10 feet up to 10 gauge

No gears or clutch . . . curl and burring held to a minimum.

Johnson **MACHINE and PRESS CORP.**
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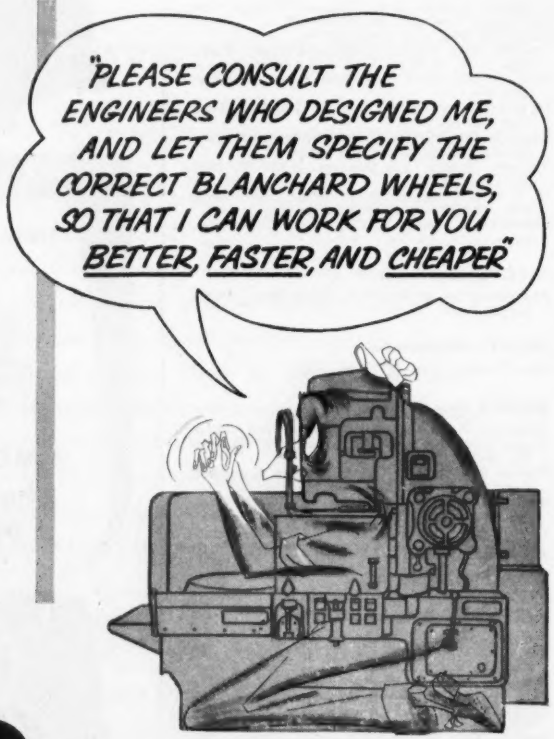
UNCLE!

Are your machines begging for mercy because of misuse?

Blanchard Grinders, *with proper grinding wheels, can* and *do* give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1¾ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of ±.0002, and flat within 2 light bands.

Blanchard wheels are best for Blanchard Grinders — let Blanchard give you the benefit of their vast experience so that you too can get the most from your Blanchard machines.



Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding." Write for free copies today!



PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



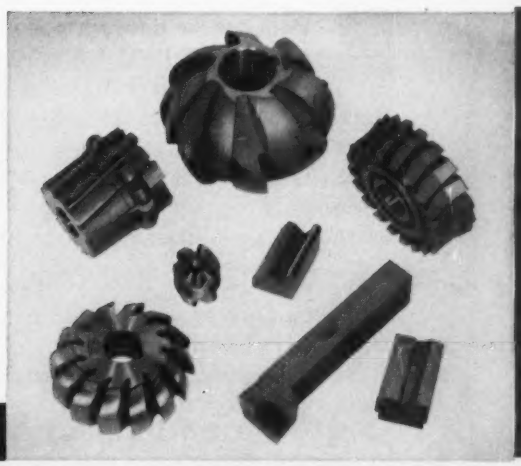
CONTINENTAL Makes Both to Suit Your Requirements

The form-relieved milling cutter at the left above has a ground form, while the cutter below has an unground form. Both are easily sharpened by grinding the faces of the teeth.

If limits are within plus or minus .001", if the form has several angles or radii, or if the job requires a fine surface finish, then we recommend the ground form. The grinding operation corrects any distortion caused by heat-treatment, insuring an accurate form and a true-running cutter for a good work finish. However, if tolerances are not too close and the form is not too intricate, you can save money by using unground form-relief cutters.

Continental, being a division of Ex-Cell-O, supplies the tools used by Ex-Cell-O for the volume production of precision parts for aircraft and other industries. This work provides an exceptional opportunity to try out various tool designs and materials and to determine definitely the best tools for today's production needs.

These facts can mean real savings to you. Call in your Ex-Cell-O representative or contact Continental in Detroit today for information on Production-Proved Cutting Tools.



In this group of special Continental tools are ground and unground form-relieved cutters, flat form tools, an offset carbide tipped tool and a double-end carbide tipped spot-facer.

Continental
TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

52-16



FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS & DELEEUW — QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

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Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded
Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARING, Ball
Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

BEARINGS, Bronze and Special Alloy
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller
Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

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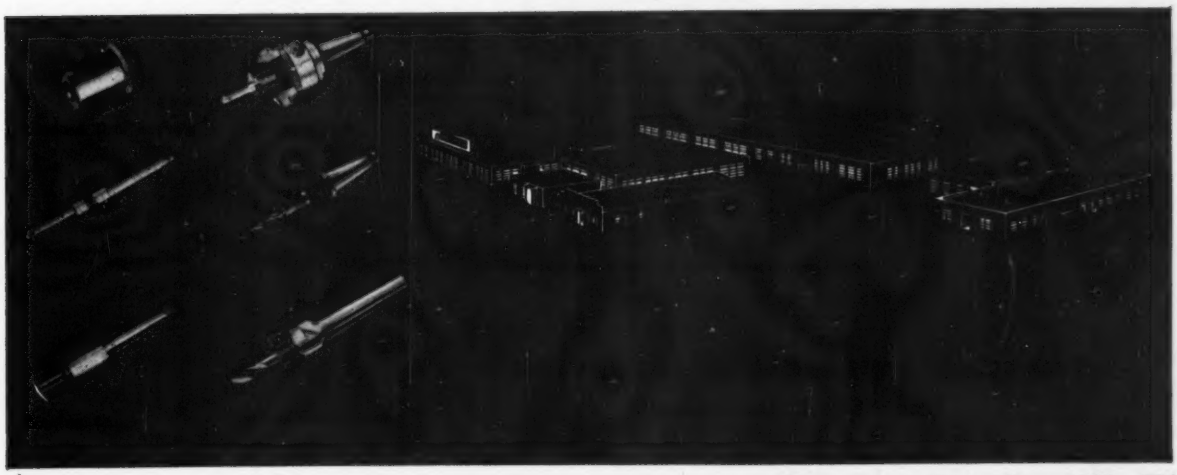
COMPLETE VARIETY OF

SIZES AND LENGTHS IN

UNIVERSAL SUPER FINISHED

DRILL BUSHINGS

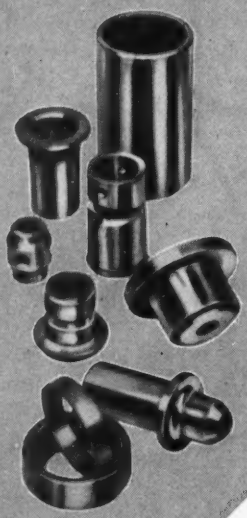
Check these features that make Universal drill bushings outstanding: 1. Super finish reduces wear to a minimum. 2. Blended radius reduces tool hang up. 3. 100% concentricity and hardness tests assure accuracy. 4. Knurled head provides quick sure grip. Order from the office nearest you ... 1060 Broad St., Newark, N.J., 5035 Sixth Ave., Kenosha, Wis., or write direct to our home office.



JOHNSON SLEEVE BEARINGS

Engineered for YOUR Application

Johnson Bronze engineering is far more than designing bearing types and shapes. It is based on thorough studies of your product, its service requirements and your methods of assembly. Johnson engineers start with complete information—load, speed, shock, operating temperatures, lubrication, corrosive conditions and other data. Design is often affected by installation and mounting methods. After this study they may recommend one of several types of sleeve bearings and the correct bearing alloy for your use. And they will design the bearing to your requirements, working closely with your engineers. If this kind of service will be valuable to you, write, wire or call for an appointment.



JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.



BRONZE-ON-STEEL—copper alloy
STEEL BACK—babbitt lined
BRONZE BACK—babbitt lined
SHEET BRONZE—plain or graphited
CAST BRONZE—plain or graphited
ALUMINUM ALLOY
LEDALOYL—self-lubricating

Sleeve Bearing Headquarters Since 1901

JOHNSON B BEARINGS
Sleeve-Type

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Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Corp., Downers Grove, Ill.
Timken Roller Bearing Co., Canton, Ohio.
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Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
O'Neill-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Machinery Div., Titusville, Pa.

BENDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neill-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Machinery Div., Titusville, Pa.
Watson-Stillman Co., Roselle, N. J.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
O'Neill-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Roselle, N. J.

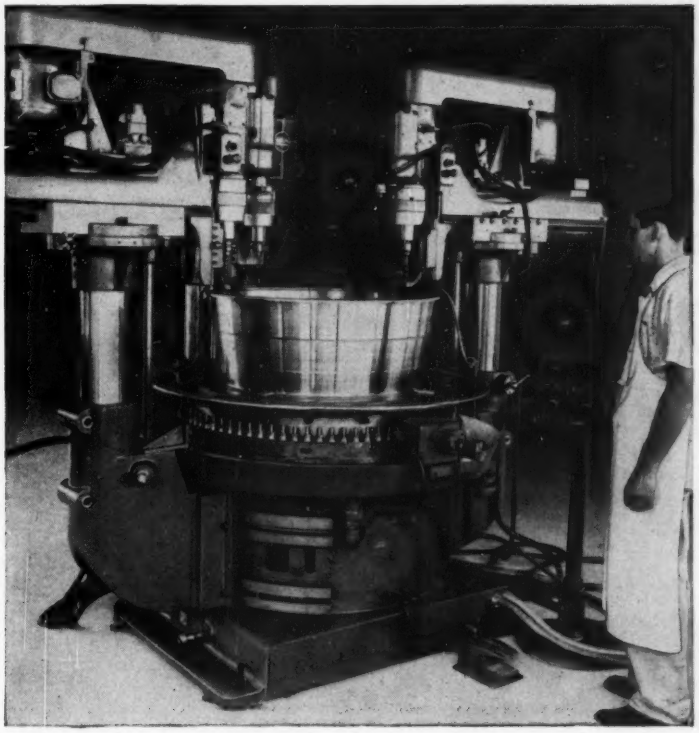
BLAST CLEANING EQUIPMENT

Leiman Bros., Inc., 156 Christie St., Newark, N. J.
Pangborn Corp., Hagerstown, Md.
Wells Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Leiman Bros., Inc., 156 Christie St., Newark, N. J.

(Continued on page 284)



Newly Created Machine Tool WITH 3 DELTA DRILL UNITS Solves Jet Engine Production Problem

- **Machine is "universally tooled"**—*quickly adjustable to unlimited variety of drilling patterns....change-over in a few minutes.*
- **Drills, reams, countersinks at one set-up.**
- **Drills easily checked for sharpness, changed quickly.**

When no conventional machine was sufficiently flexible for handling a wide variety of drilling patterns in axial-flow gas turbine engine production, Pratt & Whitney Aircraft engineers designed one—using three Delta Air Powered Hydraulic Drill Units.

These three drill heads, operating as a single machine tool, produced immediate benefits. Elimination of special jigs made it possible to have absolutely accurate dimensions in each part produced—thus insuring interchangeability of the close tolerance component parts. In addition, definite production economies were effected by elimination of costly jigs and fixtures.

Every application of the Delta Air-Powered Hydraulic Drill Unit has resulted in substantial direct savings—faster production, easier tool changes, lower costs.

There's a Delta Tool for Your Job-

WOOD OR METAL WORKING

53 MACHINES • 246 MODELS • MORE THAN 1300 ACCESSORIES

Another Rockwell *Product*

Here is another of many instances of alert production engineers finding quick solution of knotty machining problems, through application of the Delta Air Powered Hydraulic Drill Unit. Others are described in the Delta Drill Unit Catalog — containing complete specifications and guidance in selecting the right size for your needs.

DELTA MILWAUKEE

DELTA POWER TOOL DIVISION

Rockwell MANUFACTURING COMPANY

614K North Lexington Avenue • Pittsburgh 8, Pa.

☐ Please send me a new Drill Unit Catalog

☐ Please send me address of nearest Delta Drill Unit Representative

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production



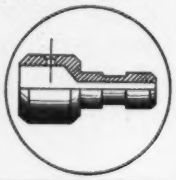
SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



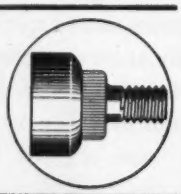
TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

Submit Sample Parts fo

SNOW

MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Erie Bolt & Nut Co., Erie, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot

Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Rogers Machine Works, Inc., Buffalo 10, N. Y.

BORING BARS

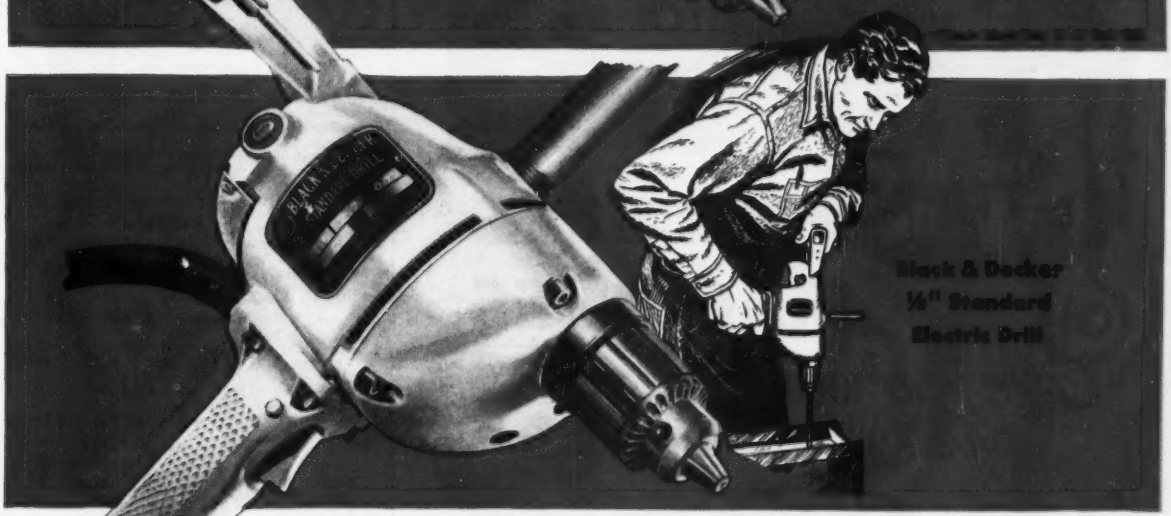
Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Madison Mfg. Co., Muskegon Heights, Mich.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

(Continued on page 286)

Drilling Problem?

Black & Decker's Drill Line is a good bet to solve it!





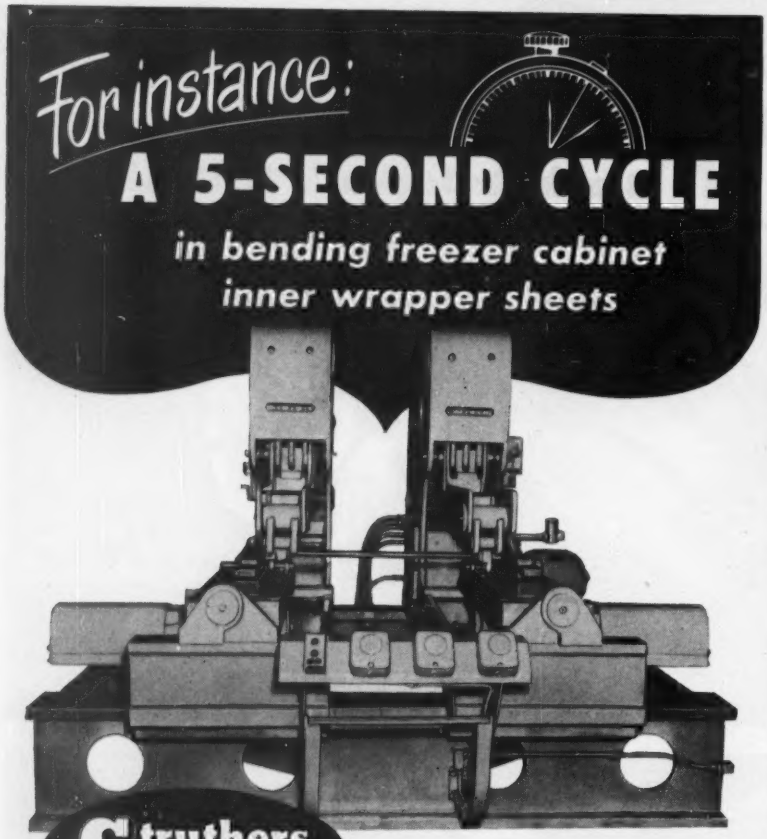
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
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Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Mummert-Dixon Co., Hanover, Pa.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.

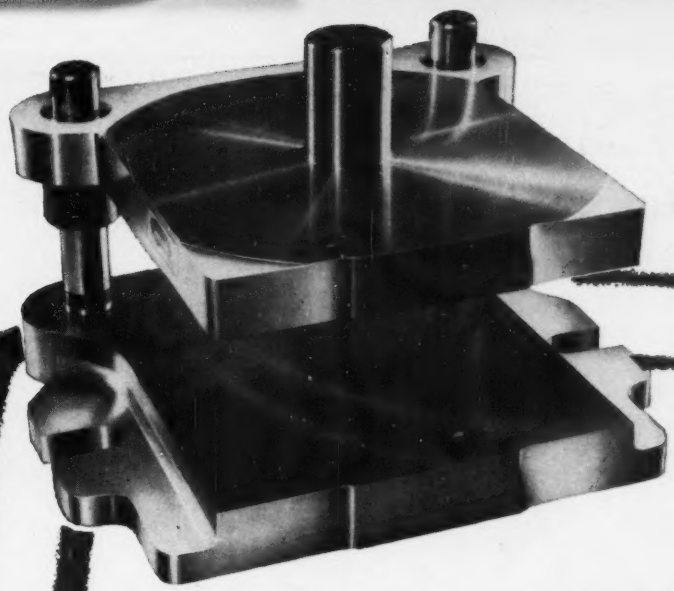
BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Madison Mfg. Co., Muskegon Heights, Mich.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.

(Continued on page 288)

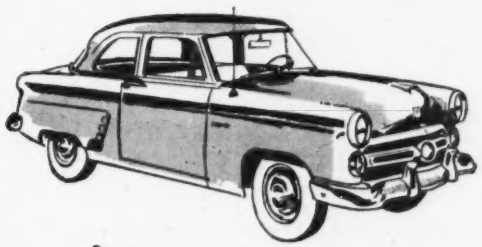


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DANLY®

DIE SETS AND DIEMAKERS' SUPPLIES

This new DUMORE® grinder eliminates hand sharpening of small drills



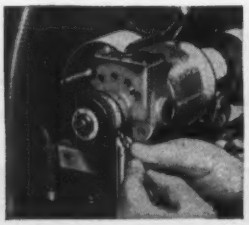
HERE'S a remarkable new grinder that sharpens small twist drills with amazing speed and precision. Enables you to do away with expensive machine shop maintenance of 2-lip drills—No. 70 to ¼".

Capable of grinding a drill point to any included angle from 90° to 150°, and any clearance angle from 5° to 15°, small-size, dull and broken drills can be quickly sharpened and reclaimed. Dumore sharpened drills stay sharp much longer, even last longer. You get correct hole size and better hole finish every time. Scrap losses, too, are held to a minimum.

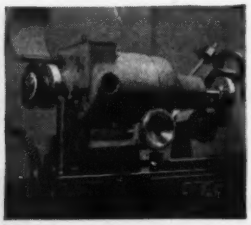
THESE FEATURES MAKE THE DUMORE PRECISION GRINDER BETTER



EXCLUSIVE FEED-IN ATTACHMENT — Eliminates breakage and wheel gouging. Allows fine control of finish cuts. Speeds difficult sharpening, requiring extreme changes of point or clearance angle.



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Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Roselle, N. J.

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American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., 3221 Frederick Ave., Baltimore, Md.

BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md., (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Atrax Co., Newington, Conn.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Roselle, N. J.

BURS

See Files and Burs, Rotary.

BUSHINGS, Brass, Bronze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

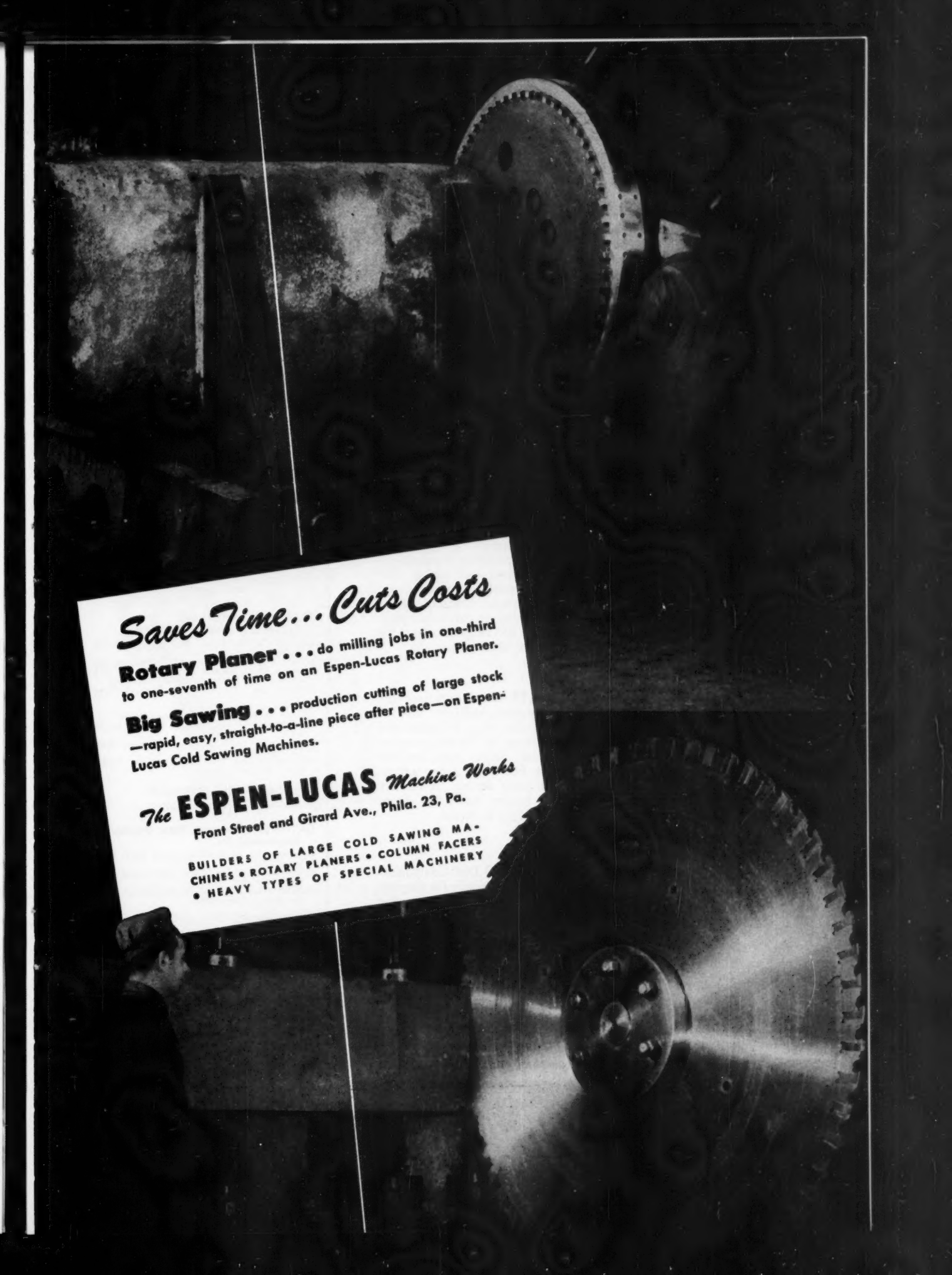
BUSHINGS, Hardened

Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.

BUSHINGS, Jig

Colonial Bushings, Inc., P. O. Box 37, Harper Sta., Detroit, Mich.

(Continued on page 290)


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Rotary Planer . . . do milling jobs in one-third to one-seventh of time on an Espen-Lucas Rotary Planer.
Big Sawing . . . production cutting of large stock —rapid, easy, straight-to-a-line piece after piece—on Espen-Lucas Cold Sawing Machines.
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Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy — the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

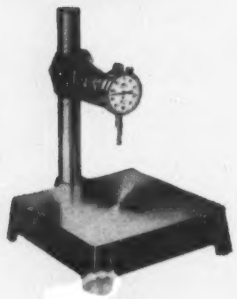
Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.



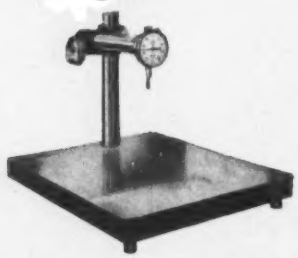
Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.



Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.



Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

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Meyers, W. F., Co., Bedford, Ind.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

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Brown & Sharpe Mfg. Co., Providence, R. I.
Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.
Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

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Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930 W. Harrison St., Chicago, Ill.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

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Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

(Continued on page 292)

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The Skinner line of power chucks and power chucking equipment has the strength, rigidity and design features so essential for today's production needs. Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates the draw bar. Skinner double acting rotating and non-rotating air cylinders are available for all sizes of Skinner power chucks, and for actuating all types of holding fixtures and tailstocks. Other Skinner accessories include hand operating valves —complete air unit including regulating valve, pressure gage and lubricator— filters — soft blank top jaws; draw bars —draw tubes, etc.

CEMENT, Disc Grinding Wheel

Besly-Welles Corp., Beloit, Wis.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Houston Grinding & Mfg. Co., 2110 Quitman St., Houston 10, Tex.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets.

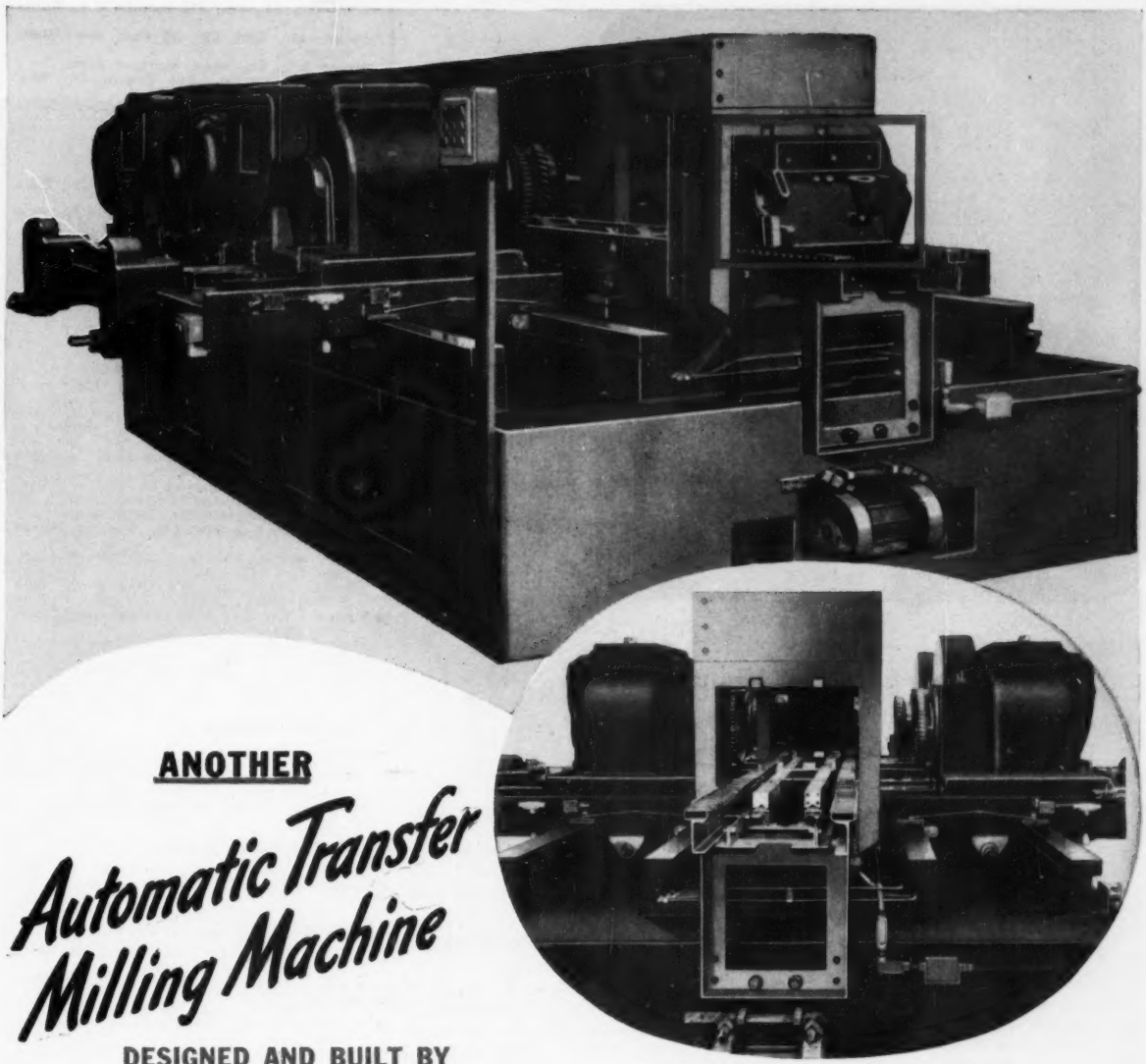
CHUCKS, Diaphragm

Van Norman Co., 3640 Main St., Springfield 7, Mass.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Drill

Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.

(Continued on page 294)



ANOTHER

Automatic Transfer Milling Machine

DESIGNED AND BUILT BY

MOTCH & MERRYWEATHER

End view showing transfer mechanism and 75 h. p. milling heads in retracted, accessible position.

to Rough-Mill and Finish-Mill Both Ends of Automotive Cylinder Blocks

• Cylinder blocks are fed to the machine, transferred from station to station, and discharged to the next operation. This machine forms an important link in a completely automatic production line.

Manufactured by —THE MOTCH & MERRYWEATHER MACHINERY CO.—
CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY • MACHINES AND EQUIPMENT



After extensive tests —

Leading Heating Control Manufacturer Adopts Millers Falls Electric Drivers For All Precision Assembly Lines

The Problem: Setting large numbers of machine screws and nuts in delicate, complex electronic control assemblies. Speed and economy essential. Torque must be maintained constantly at all points with extreme accuracy.

Solution: Demonstrations and test runs were conducted with numerous electric and pneumatic tools. On every count, Millers Falls Screw Drivers and Nut Setters with the "Adjustomatic"® Clutch were outstanding for this difficult assignment.

They are powerful, compact, smooth running. And the patented "Adjustomatic" Clutch maintains exactly correct tensioning not just for a day, but for month after month. Their performance has proved so superior that Millers Falls Drivers are now standard on all precision assembly lines in the plant. Approximately 100 are currently in use, and the company reports: ". . . very materially increased production and reduced cost."

Speed, Economy, Precision, Dependability

Whatever your driving problem, it will pay you well to investigate the time- and money-saving performance offered by Millers Falls versatile, power-packed Screw Drivers, Nut Runners and Stud Setters. They are breaking production records in hundreds of plants.

Write for full details on these and other high-efficiency Millers Falls electric production tools — drills, bench and portable grinders, sanders, polishers, hammers and saws. Demonstrations arranged on request.

MILLERS FALLS COMPANY, Greenfield, Mass.



Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.

CHUCKS, Gear

Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

CLAMPING APPLIANCES FOR MACHINES TOOLS

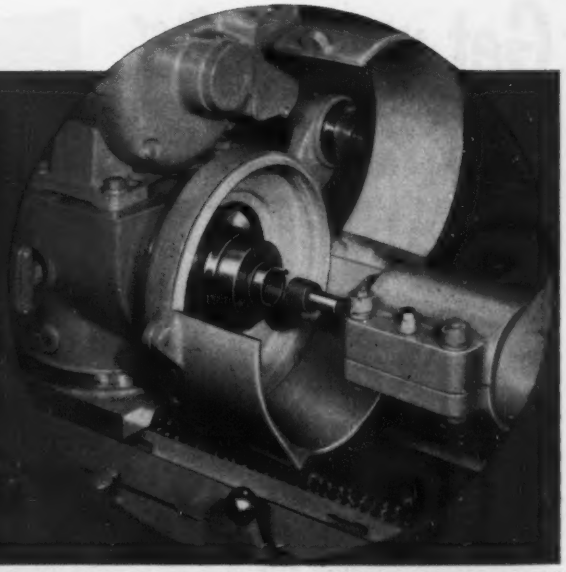
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

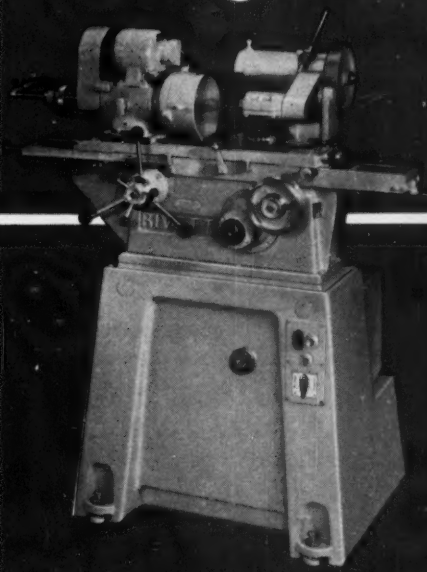
CLAMPS

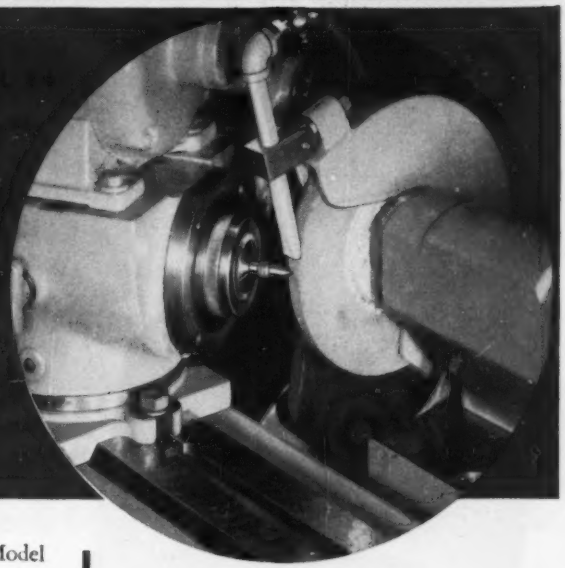
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.

(Continued on page 296)

A new small hole grinder







Easily converted for external grinding



Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the tool-room and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3″ diameter, with a maximum 4″ depth depending upon diameter; external work to 3″ diameter by 4″ length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001″.
- ★ Hand infeed with coarse adjustment to .001″, and fine to .0001″ reduction of work diameter.

RIVETT **LATHE & GRINDER, Inc.**

Dept. MR-9, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

Get up to 20% EXTRA PRODUCTION with



WILLIAMS

IMPACT

"SUPERSOCKETS"®



- EXTRA-TOUGH ALLOY STEEL
- FULLY HEAT-TREATED
- DESIGNED FOR QUALITY PERFORMANCE
- MACHINED FOR A PERFECT FIT

HOW?

The built-in durability of Williams Impact "Supersockets"® outlasts ordinary types... gives you that *extra* on-the-job time which means more production at less cost. A performance comparison under your working conditions will point up the superiority of Impact "Supersockets"® Available in ¼, ⅜, ½, ⅝, ¾, 1 and 1½" square drive sizes... over 300 sockets and accessories... they can be used with all types of power wrenches and nut runners... as well as Williams hand socket drivers.

Want to know more?... Write us for detailed, illustrated Catalog A-100. Or ask your Williams Distributor.

J. H. WILLIAMS & CO., 415 Vulcan St., Buffalo 7, N. Y.

Drop-Forgings and Drop-Forged Tools

Williams Impact "Supersockets"® are sold through your Distributor who knows and can supply your needs promptly — correctly.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Warner Electric Brake & Clutch Co., Beloit, Wis.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

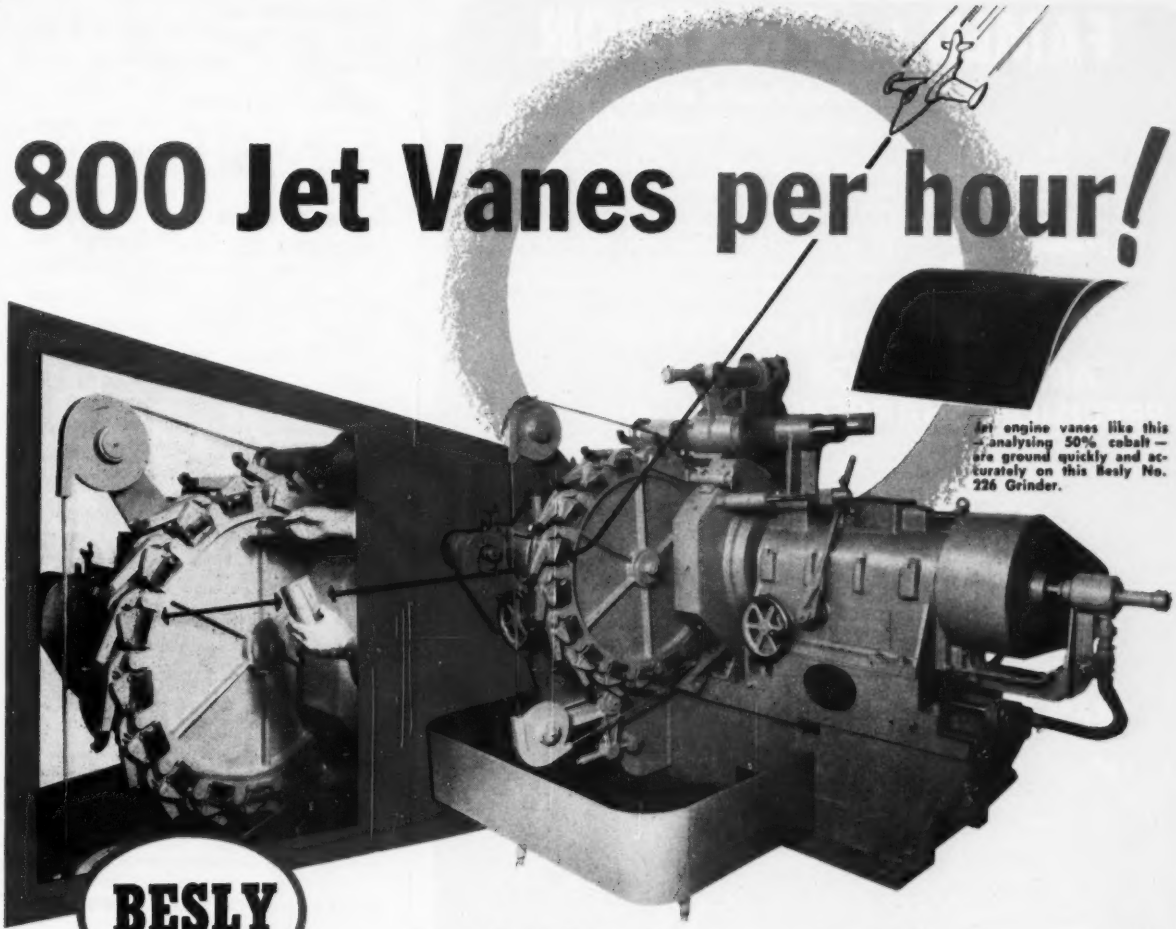
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

COMPOUNDS, Resin and Molding

Bakelite Co. Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

(Continued on page 298)

800 Jet Vanes per hour!



Jet engine vanes like this — analysing 50% cobalt — are ground quickly and accurately on this Besly No. 226 Grinder.

BESLY

Each of two No. 226-30" Double Spindle Grinders turns out approximately 800 jet vanes per hour, removing 1/16" and .010" of stock respectively on rough and finish grinding. Each Grinder has a rotary unit and feed wheel with 18 work stations. Blades are loaded by hand, then automatically located and clamped by a cable clamping mechanism. After passing between abrasive wheels where stock is removed from both ends, the work is partially ejected from the station and unloaded by hand.

BESLY-WELLES
CORPORATION
Established as Charles H. Besly and Company in 1873.
112 Dearborn Ave. BELOIT, WISCONSIN

Jet Engine Vanes ground at high production rate on BESLY 226 Double Spindle Grinders

Important savings are effected in material, weight and cost of production by fabricating Jet Engine Vanes from heat resistant alloy sheet which is formed and welded to the required airfoil.

The above illustration shows one of two Besly No. 226-30" double spindle grinders employed to rough and finish grind the ends of the Jet Engine Vanes. The two open ends of the vanes are ground simultaneously by passing between two parallel abrasive wheels where approximately 1/16" of stock is removed from each end.

Every 4½ seconds a finished ground vane is delivered from these grinders. The difficult fixturing problem of locating and clamping the unusual form was solved with typical Besly skill and ingenuity.

The problem of eliminating heat distortion and burning when grinding tough, thin-wall material was solved by the use of a highly efficient coolant system and the proper abrasive wheels.

This is another example of results achieved when Besly experience applies Besly grinders — either basic, with adaptation or specially engineered — to practically any grinding operation.

If you have a grinding need or problem that's hard to crack, talk to the Besly representative in your territory. Or—send the coupon below for more information.

BESLY

BESLY GRINDERS and ACCESSORIES
BESLY TAPS, DRILLS, REAMERS
BESLY-TITAN ABRASIVE WHEELS

BESLY-WELLES CORPORATION
112 Dearborn Ave.
Beloit, Wisconsin

☐ Please send us bulletin of detailed information on Besly No. 226 Grinders.

☐ Also have a representative call.

Name_____

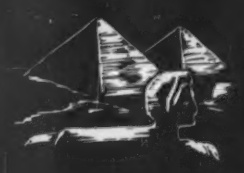
Company_____ Position_____

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City_____ Zone____ State_____

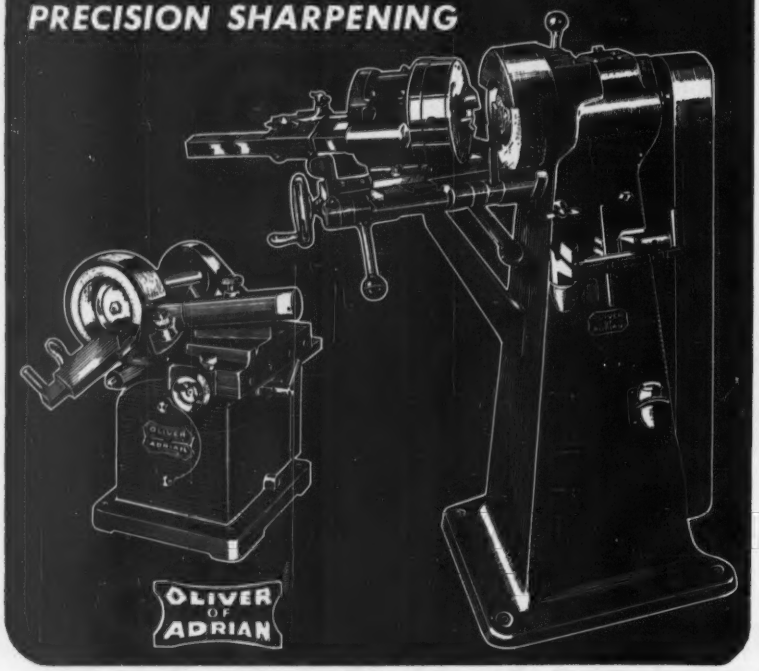
FAMED for PRECISION

The Great Pyramid of Gizeh Ranks as One of the Seven Wonders of the World



Built by unknown engineers thousands of years ago to cover the Tomb of the Pharaoh Cheops, it is believed, that through the exactness of its orientation and the precisenss of its measurements, to have been built as an astronomical observatory or for recording geometrical facts. Modern scientists are still baffled by the precision of the techniques used in this ancient structure.

OLIVER DRILL POINTERS ARE FAMED FOR PRECISION SHARPENING



Production slowdowns are costly—frequently they are caused by improper grinding of the drill points. Don't be baffled by these costly delays—they can be eliminated with Oliver Drill Pointers which give balanced cut with each lip doing equal work. Prove to yourself as has been proved in thousands of toolrooms that machine grinding is the best and most accurate method for restoring efficiency to drills. Avoid excessive drill costs and imperfect holes by machine grinding on Oliver Drill Pointers. With the Oliver Method your drills will cut faster, last longer, and produce more accurate holes.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Full automatic operation.

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

OLIVER INSTRUMENT CO.

1410 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS · TOOL & CUTTER GRINDERS · DRILL POINT THINNERS · TEMPLATE TOOL GRINDERS · FACE MILL GRINDERS · DIEMAKING MACHINES

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, O.
Maryland Precision Instrument Co., 12 E. Lanvale St., Baltimore 2, Md.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Arrow-Hart & Hegeman Elec. Co., Hartford 6, Conn.
Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC.

Hapman Conveyors, Inc.

COOLANT TABLES

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.

COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

(Continued on page 300)

How the Fable of

"The Birds, The Beasts & The Bat"

has a parallel in Cutting Fluids



. . . thanks to Aesop for this Fable

The Birds were engaged in a fierce battle with the Beasts. The Bat figured he could pass as either a Bird or a Beast and he wanted to be on the winning side. As the battle see-sawed he flitted back and forth. The Birds finally won but the Bat got back to their side too late and was chased away to a cave, where he has lived ever since, ashamed to come out except at night.

The Parallel . . .

Like the Bat in the fable, some cutting fluids appear to be both Bird and Beast, but may be neither. If you are going to tap a tough, difficult to machine metal you need a heavy duty cutting oil with high *anti-weld* and good *lubricity* characteristics. On a less exacting light milling job a conventional water-mix fluid with good temperature regulating properties is usually the answer.

The point the fable emphasizes is that a cutting fluid can't be on both sides of the fence. You don't need a different fluid for every job but you need one that's *right* for the job. Stuart products and Stuart experience will give you the best possible results in terms of finish, tool life and production. Ask to have this demonstrated to you by a Stuart Representative.

More Than a "Coolant" is Needed

D.A. Stuart Oil co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Ill.



SEND FOR BOOKLET *entitled More Than a "Coolant" is Needed*

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

to D. A. Stuart Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.

Your Name .....

Title .....



In one operation, this Farquhar Hydraulic Press forms straight mild steel bars into elevator brackets—at closer tolerances than any former method.

OTIS ELEVATOR COMPANY *boosts production, slashes time and labor costs in half, with this*

FARQUHAR HYDRAULIC PRESS

In forming lengths of mild steel, the Otis Elevator Company, world's largest elevator and escalator manufacturer, would heat steel and bend it while it was hot. Trying to improve on this system, Otis Production Engineers developed a cold bending process. Farquhar Engineers were contacted, and a 250 Ton "Bulldozer" Horizontal Press was recommended and installed. By bending the steel bars cold in the Bulldozer, Otis has effected a 50% increase in production alone! Time and labor costs have been reduced an estimated 33⅓%! In addition, the Bulldozer operates at closer tolerances than the old heat and bend method. All this, 8 hours a day, 5 days a week, with maintenance costs that Otis terms "negligible."

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production! Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Your request will bring them running . . . at no obligation, of course.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

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Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

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Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES, Hand Traveling

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 225 Mill St., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

(Continued on page 302)



Reverse brake band anchor forging

Finished work part

FIXTURES

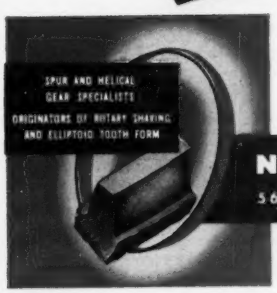
the Key to Broaching Speed and Economy

Because the fixtures so often determine the speed and economy of broaching operations, it is just "good business" to entrust their design to specialists of proven experience and ability in the broaching field. Manufacturers, high production and job lot, depend on Red Ring broach engineers to develop their tooling.

Illustrated here are some of the fixtures used to produce the reverse brake band anchor, an element of a modern automotive torque converter. Of the 7 machining operations on this part, 5 are broaching.

Ask Red Ring broach engineers for suggestions on your tooling.





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Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
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Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy, Detroit 1, Mich.

CUTTERS, Rotary

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CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

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See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 1300 18th St., Racine, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

(Continued on page 306)

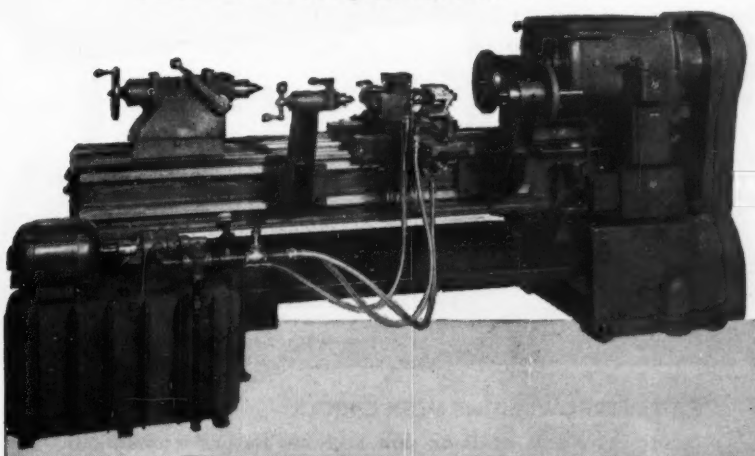


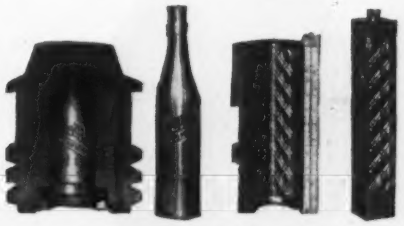
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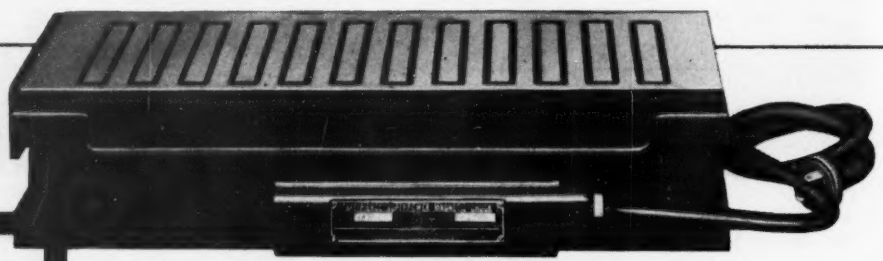
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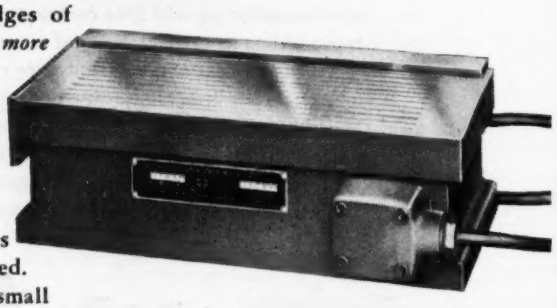
TAFT-PEIRCE *SUPERPOWER* MAGNETIC CHUCKS



Standard Magnetic Chucks

T-P SUPERPOWER RECTANGULAR CHUCKS

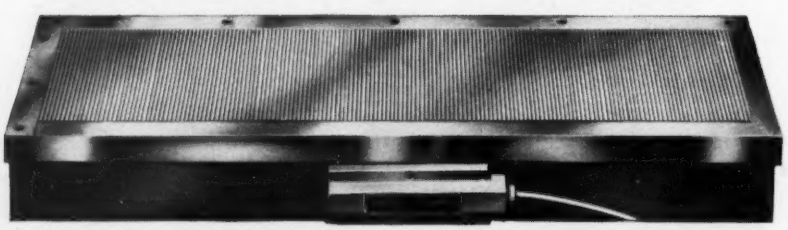
provide pull right to edges of face plate. Thus pack *more* power in less space . . . to increase versatility, speed, and safety of setups. New Superpower Chuck with longitudinal pole pieces, at right, is most versatile yet devised. Handles both large and small work with equal ease.





T-P SUPERPOWER ROTARY CHUCKS

for rotating spindles. Provide greater work range and efficiency with their greater holding power and compactness. Available in standard sizes. Also with fine mesh face plate for small pieces.



T-P SUPERPOWER FINE MESH CHUCKS

secure extremely small or thin sections formerly found impractical for magnetic chucking. Furnished in standard or special sizes.

Adjustable Magnetic Chucks



T-P SUPERPOWER DUPLEX BASE CHUCK

Saves time in grinding or machining angle work. Swivels 90° on either side of horizontal. Tilts to 14°. Clamps rigidly in any position. Available in standard sizes.



T-P SUPERPOWER SWIVEL BASE CHUCK

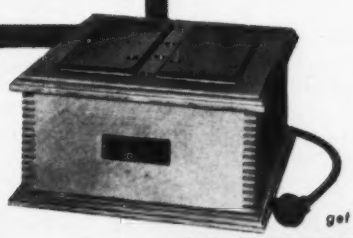
Swivels 90° on either side of horizontal. Clamps rigidly at any angle. Mounts directly on face plate of other chuck, or bolts permanently to table. Available in standard sizes.



T-P SUPERPOWER SINE ANGLE CHUCK

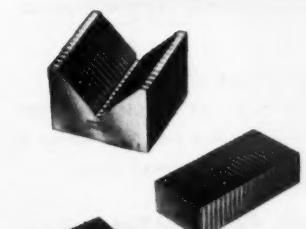
Speeds positioning of tricky angle grinding jobs. Gage blocks placed between roll and base plate assure high precision of compound angle setups.

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Eliminates all trace of residual magnetism quickly, dependably. Standard in either 110 or 220 volts, 60 cycle. 440 or 550 volts on special order.



T-P UNIVERSAL MAGNETIC PARALLELS AND V-BLOCKS—Effective on any style or make of face plate. Available in stock sizes. Special sizes made to order.

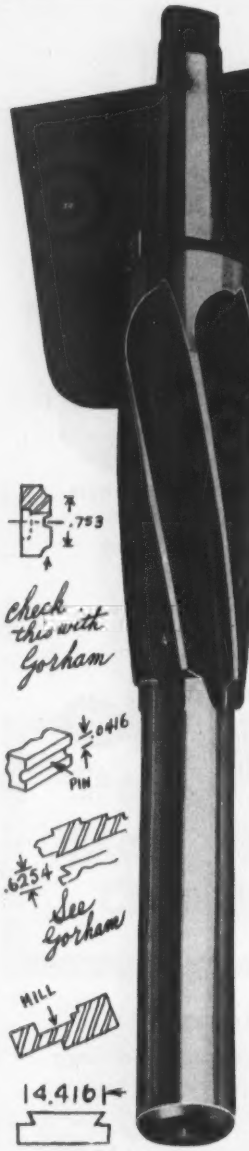
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T P

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For fast, practical solutions to tough tooling problems, call in the expert . . . your nearby Gorham Field Engineer! He provides a complete engineering service to determine your exact tooling requirements. For instance:

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then . . . he develops practical design and engineering specifications for a special cutting tool, metallurgically "tailor-made" for your application.

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Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.

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Hannifin Corp. 1101 S. Kilbourn Ave., Chicago, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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DEMAGNETIZERS

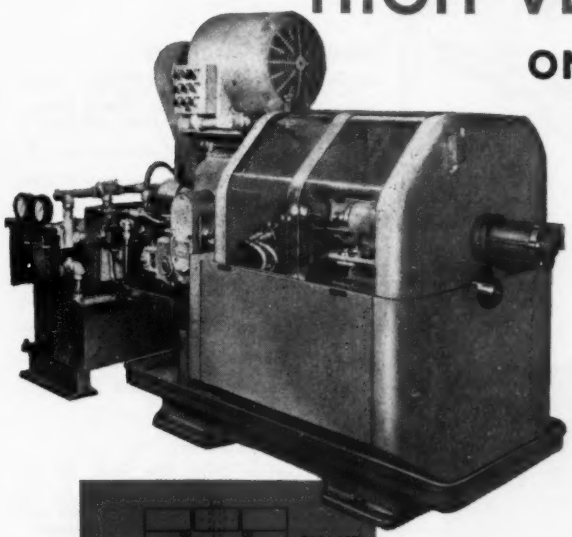
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Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Walker, O. S., Inc., Worcester, Mass.

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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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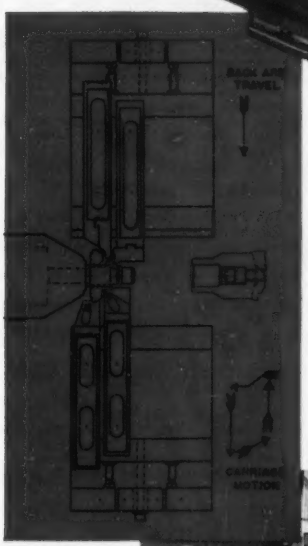
(Continued on page 308)

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS



SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

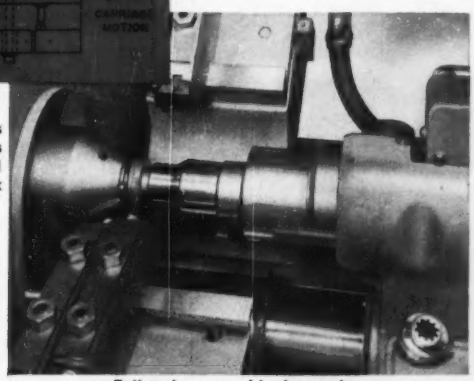
Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.



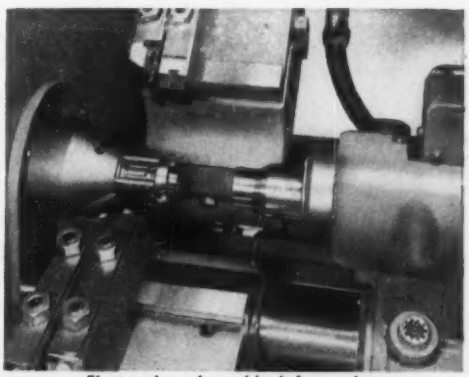
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

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Machine Tool Craftsmen Since 1835

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Carbide Cutting Tools
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Wesson Multi-cut style DTRL—shown above—is the most modern tool holder in the industry today. It was designed specifically for tracer or follower lathes and Jet engine production.

Equipped with Wessonmetal cemented carbide inserts, it provides 35° clearance on straight shoulder turning, cutting from left to right or right to left. Indexing and turning of insert, gives users four cutting edges before regrinding. The Multi-cut tool holder is practically indestructible. Inserts are replaceable.

Write for folder describing many different styles and sizes today.

WESSON COMPANY *Affiliated with* WESSON METAL CORPORATION
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PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS

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DIE-CASTING

See Castings, Die.

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Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Kux Machine Co., 3930 W. Harrison St., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE CUSHIONS

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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Grob Bros., Grafton, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

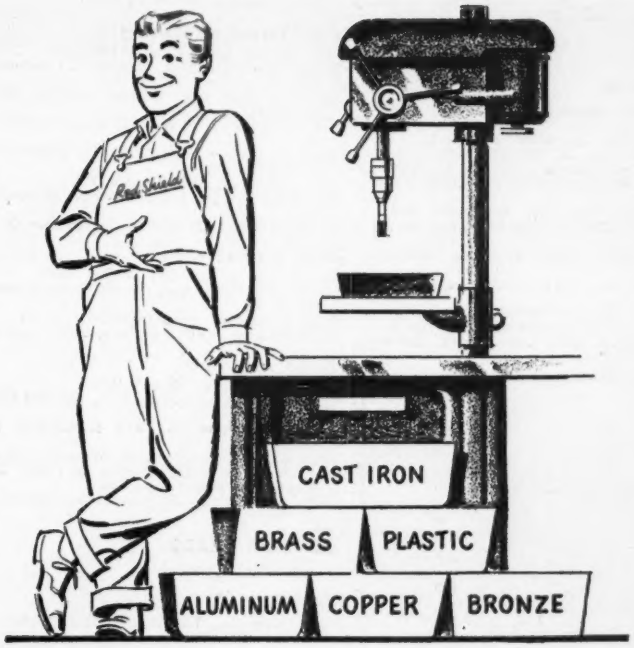
DIE-SINKING PRESSES

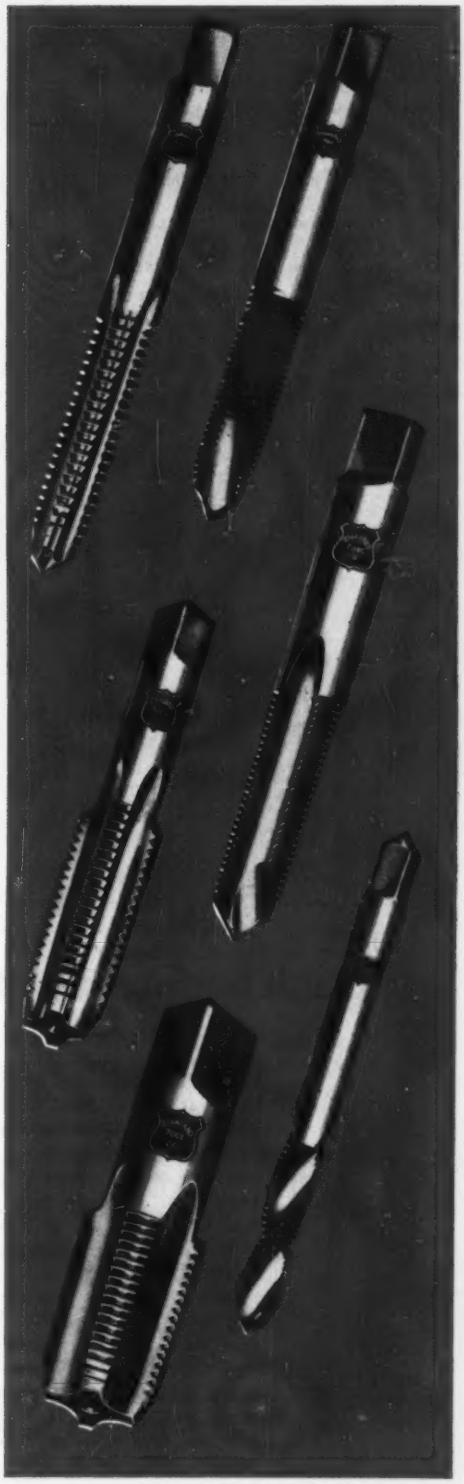
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

(Continued on page 310)





Special metals to tap? Red Shield makes it easy

TAPPING operations on materials such as aluminum, plastic, cast iron and non-ferrous metals are often unduly costly or slow.

To speed up and reduce the cost of such operations, specify and use Standard Red Shield Taps that are designed for use on these materials. Uninterrupted production and superior quality work results.

Standard service engineers are always glad to offer helpful suggestions on tapping problems. No cost or obligation. Reliable Mill Supply Distributors coast to coast provide efficient service on all Standard Red Shield metal cutting tools. It pays to Standardize.

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Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., Detroit, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasive

Besly-Welles Corp., Beloit, Wis.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Bridesburg, Philadelphia, Pa.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DIVIDING HEADS

See Index Centers.

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, Drill

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 312)



high boring costs make you blue?

LET THE MAN WITH HOLES IN HIS HEAD LOWER THEM FOR YOU

Every Madison cutter, and bar, no matter what its size, is designed to do your boring operations faster at lower cost. With Madison cutters and bars you never get those high-boring-cost-blues.

Madison *cutters* range in diameter from ⅝" to any desired size. Madison *bars* range from 2½" to fourteen feet in length . . . or longer. The secret of Madison's ability to cut costs is Madison's exclusive cutter and bar design. First, there is Madison's two bladed cutter. It provides generous chip clearance . . . permits faster cutting without overheating. Second, is Madison's exclusive float design. Cutters float in Madison bars, special floating tool holders are never needed . . . both edges of the cutter take an equal bite. That means more holes per cutter, longer cutter life with fewer regrinds. You get these features, plus many other Madison advantages, when you ask the "Men With Holes in Their Heads" to cut your boring costs. Write today. A brief letter will do.

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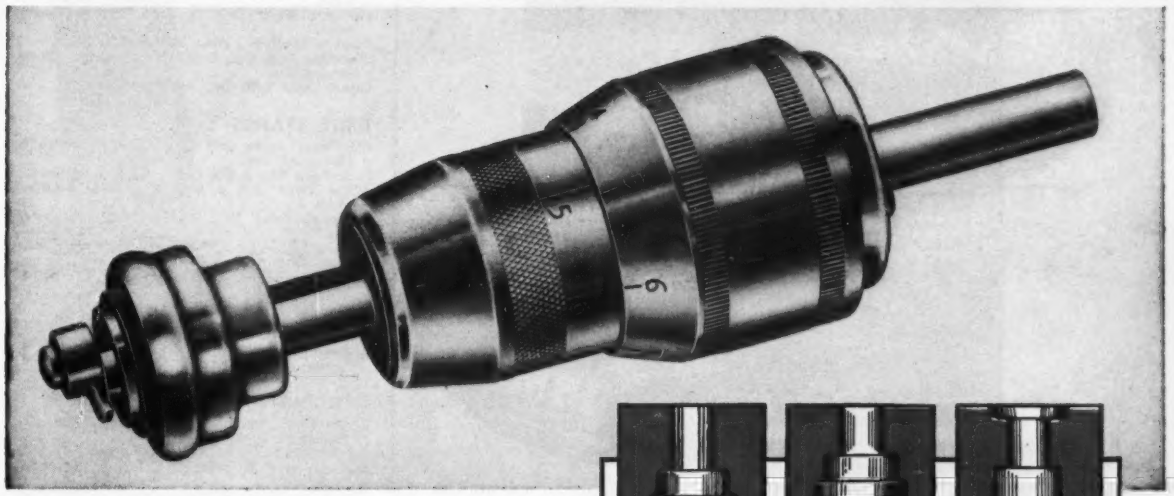


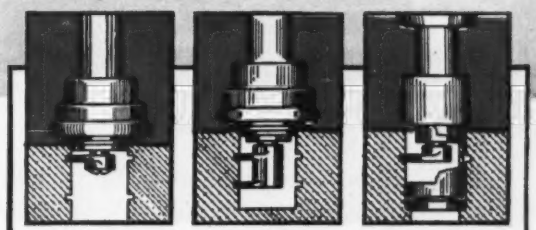
MADISON MANUFACTURING COMPANY
DEPT. M MUSKEGON, MICHIGAN

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!





Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

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Manufactured under U. S. Pat. 2,411,426

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Please send me complete information on Waldes Truarc Internal Grooving Tool.

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Company_____

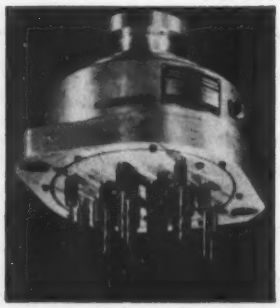
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IBM loses no time in drilling millions of holes in parts for business machines. With the help of Zagar, IBM has taken advantage of the many features offered in Zagar Gearless Drillheads: many holes drilled at one pass; any number of holes in any material in any pattern as close as twice drill diameter; accurate spacing maintained. Zagar engineering can readily adapt standard Zagar Gearless Drillheads to meet your particular needs. Send in your parts drawings for a quotation.



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24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

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Drillunit, Inc., 635 Mt. Elliott, Detroit 7, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILLING ATTACHMENTS, Chip Breaker Type

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.

DRILLING MACHINES, Automatic

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Atlas Press Co., 1253 No. Pitcher St., Kalamazoo, Mich.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Dumore Co., 1300 17th St., Racine, Wis.
Famco Machine Co., 1300 18th St., Racine, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

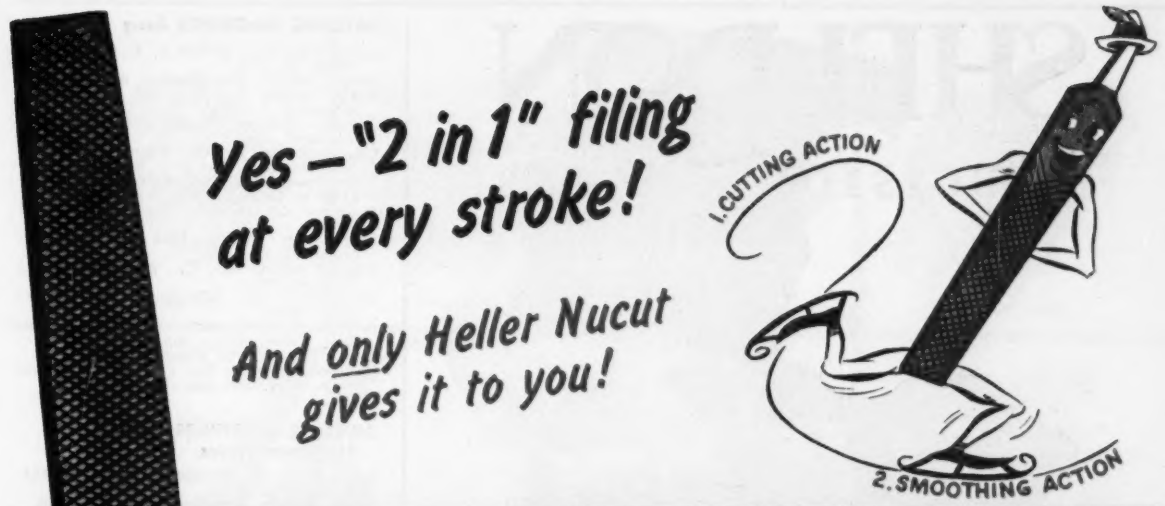
DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

DRILLING MACHINES, Deep Hole

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
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Wales-Strippit Corp., North Tonawanda, N. Y.

(Continued on page 314)



Yes—"2 in 1" filing at every stroke!

And only Heller Nucut gives it to you!



HELLER NUCUT WAVY TEETH FILE

Reg. U. S. Pat. Off. Pat. No. 2027039

WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

Just take a few strokes... and you'll prove NUCUT's superior cutting power to your own satisfaction. NUCUT's *two* distinct sets of teeth, scientifically positioned in a patented wavy construction, make the difference.

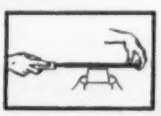
The coarse teeth cut clean, deep, true—without scraping or skidding. At the same stroke, the fine teeth leave the surface sleek, smooth. There you have it—the fastest, easiest, best filing you've ever seen.

Your distributor has the sizes, shapes and cuts you need.

HELLER BROTHERS COMPANY
A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

***Right* way to hold a file.** Hold handle with right hand and tip with left hand. Position of left hand varies with job.

(1) FOR GENERAL FILING: Let right thumb lie along the top of handle and fingers curl around handle in a natural grip.



(2) FOR REMOVING STOCK RAPIDLY: Let ball of left thumb press upon top of file, and fingers wind around file.



(3) FOR FLAT FILING: Note extended position of thumb and fingers on top of file.



(4) FOR PRECISION WORK: The grip shown allows maximum guidance and control.

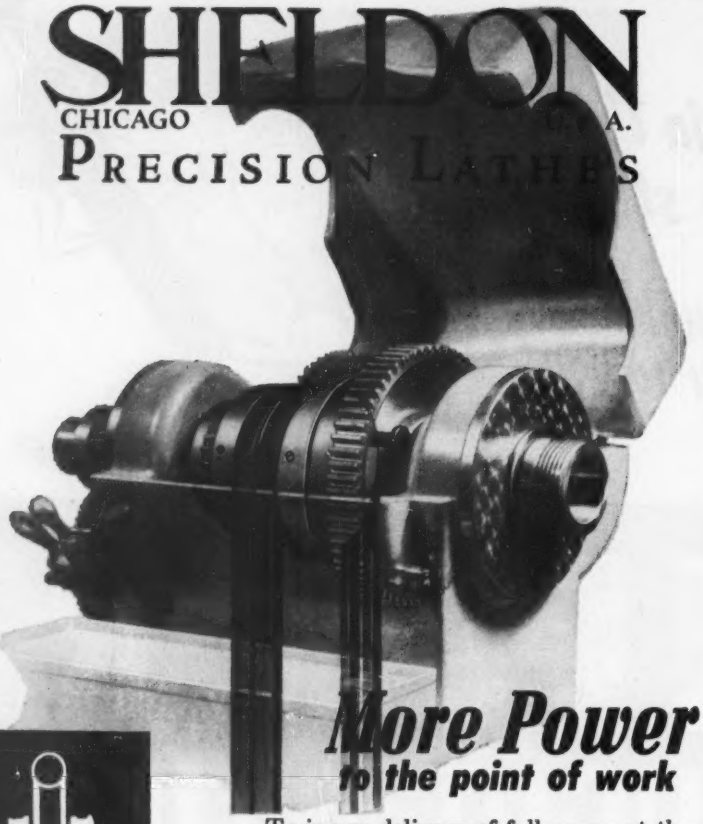


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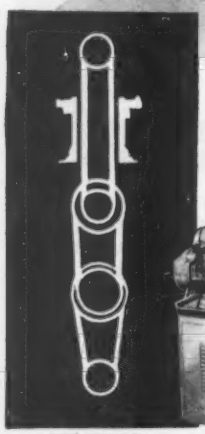
PRECISION LATHES



More Power
to the point of work

To insure delivery of full power at the point of work . . . to prevent slippage on heavy cuts, the underneath motor drives of SHELDON Precision Lathes have double V-Belts driving the spindle. Tandem V-Belts, each of which engages the spindle around a full 50% of its circumference.

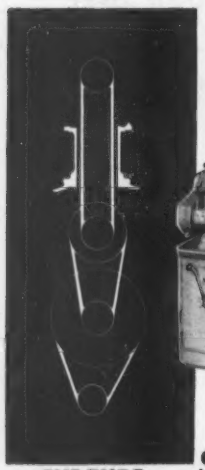
You will note a feature of SHELDON underneath motor drives not common to other moderate priced lathes is the extra, underneath counter shaft that permits driving thru a *standard* 1-piece lathe bed. There is no cutting away of the bed for belt clearance, nor use of "spliced" beds, in SHELDON Precision Lathes.



"E" TYPE

Completely enclosed in the cabinet leg, the SHELDON Type "E" Underneath Motor Drive has matching 4-step, V-Belt sheaves which provide 4 speeds (8 spindle speeds). All belts are provided with individual means for permanent adjustment of tension.





"U" TYPE

With a SHELDON Type "U" Underneath Motor Drive, all speed changes are instant—are made by clutches operated by levers that are conveniently located outside the enclosed cabinet leg. 4-speeds (8 spindle speeds) and individual belt tensioning means are provided.



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Consolidated Mch. Tool Corp, Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S 7th and N Sts., Richmond, Ind.

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Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Center Column Type

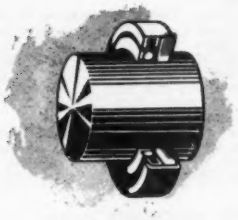
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

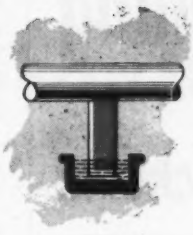
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
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Famco Machine Co., 1300 18th St., Racine, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

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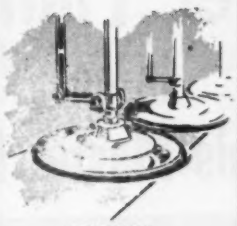
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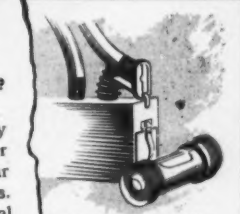
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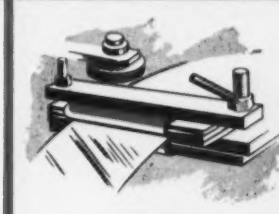
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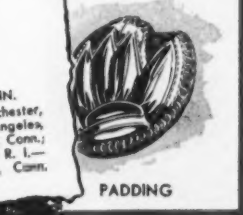
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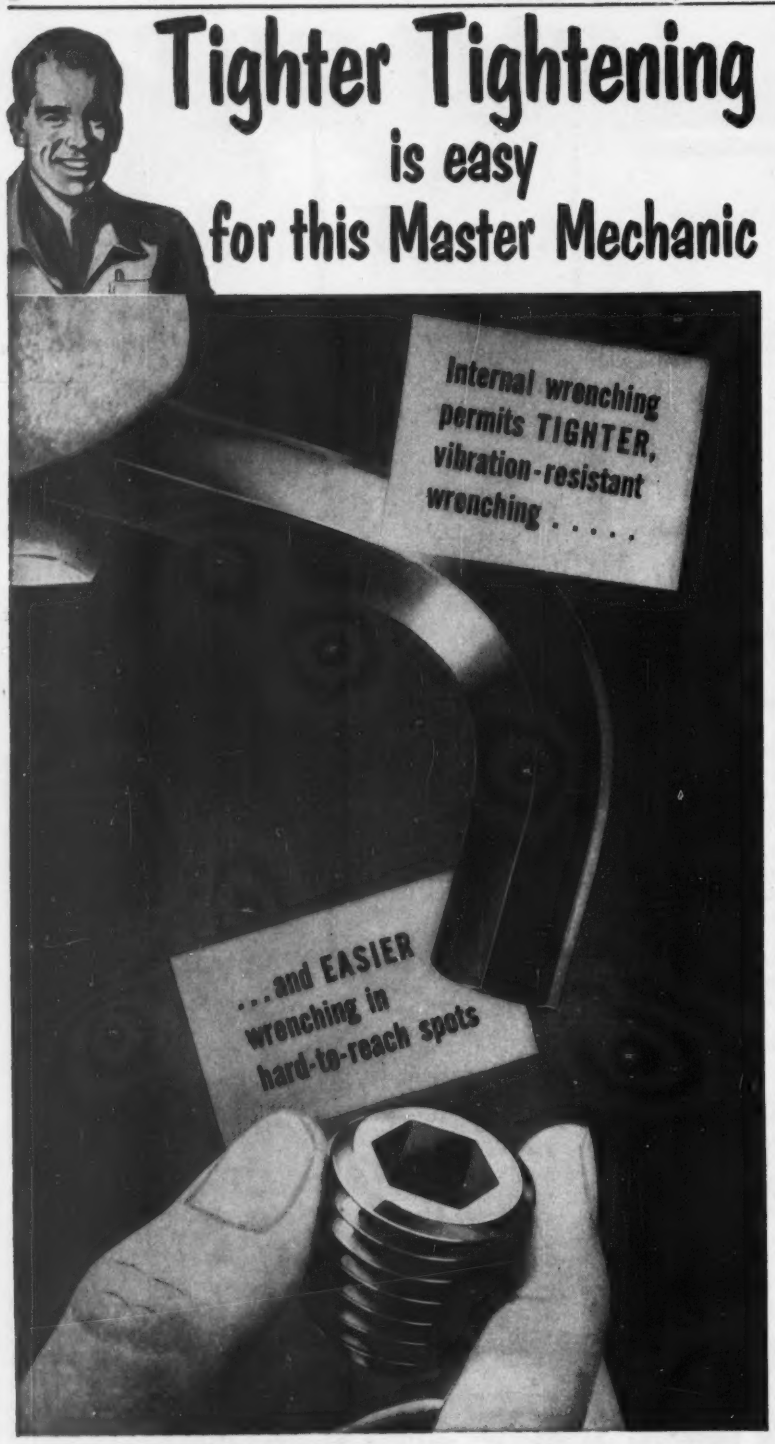
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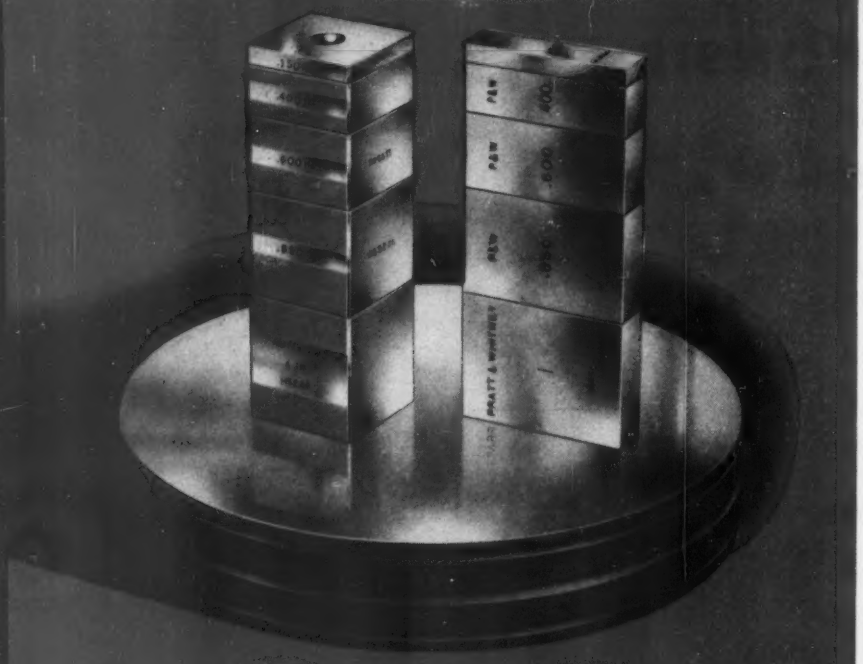
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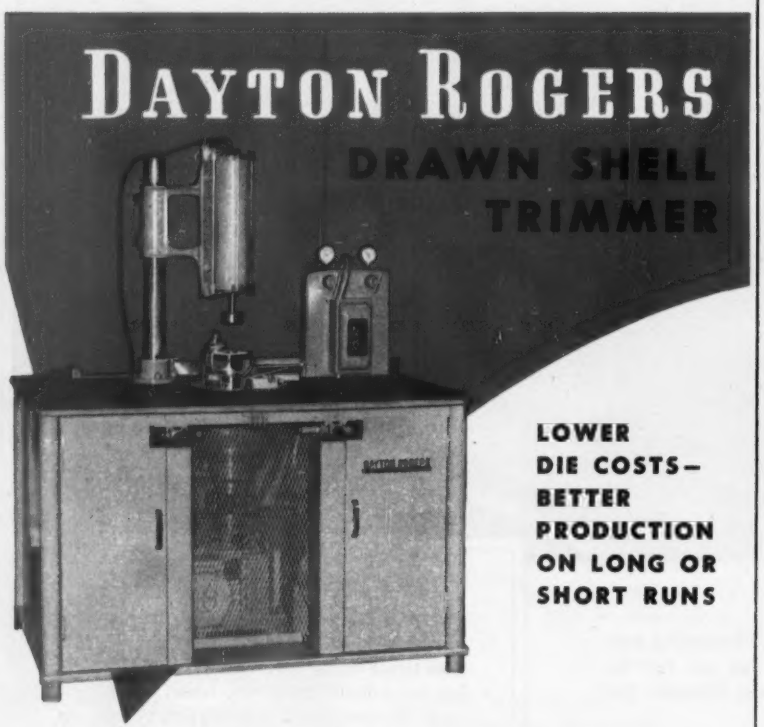
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Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich



LOWER DIE COSTS— BETTER PRODUCTION ON LONG OR SHORT RUNS

THE new Dayton Rogers Drawn Shell Trimmer was especially designed to trim square or rectangular shells with small corner radii. It will also bead, knurl, form serrate, stencil, offset, and bevel. All such shell finishing operations are performed quickly, accurately, and efficiently in one work cycle. It will handle drawn shells of practically any depth and of thickness up to 13 gauge. It is easily and quickly set up and tooling is relatively inexpensive.

Ask for typical costs and Suggested tooling without obligation.

DAYTON ROGERS
Manufacturing Company

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H., Co.., Detroit 34, Mich.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Webber Gage Co., 12909 Triskett Rd., Cleveland 11, Ohio.

GAGES, Air

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Surface Checking Gage Co., 5864 Hollywood Blvd., Hollywood 28, Calif.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial) Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

(Continued on page 324)

9 ■ UNIT PRODUCTION LINE OF BAUSH W-8 HEAVY DUTY MULTI-SPINDLE MACHINE TOOLS DRILL — REAM — COUNTERBORE AND TAP MAJOR DEFENSE ITEMS.

This concern — one of our largest heavy equipment producers — has found this Baush production line to be both labor and time saving.



BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

All 9 machines are arranged to accommodate operations on more than one part. Conveyors tie all machines together so parts move through entire lineup with a minimum of manual effort.

Part is loaded into work-holding pallet and each machine is provided with elevating and locating mechanism for positioning and clamping pallets. Pallets then move progressively through entire lineup for numerous and different machining operations, giving a smooth continuous flow of defense production.

In addition to the W-Type machine tools illustrated here we also produce Automatic Transfers — Way Type Machines —Worm Gears and Universal Joints.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Surface Checking Gage Co., 5864 Hollywood Blvd., Hollywood 28, Calif.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Bath, John, Co., Inc., Worcester, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GASKETS

Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CUTTING MACHINES, Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.

(Continued on page 326)





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famco COST CUTTING machines

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Famco proudly announces the purchase of new plant and office facilities at Kenosha, Wisconsin. Part of an expansion program undertaken by Famco, the new buildings—situated on twelve acres overlooking Lake Michigan—add substantial floor space to Famco's operation . . . with sufficient ground for further expansion as needed. It is requested that all future contact with the Company be made at the above address.

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BAND SAWS
DRILL PRESSES
FOOT PRESSES
POWER PRESSES
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GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster, Pike and Mariemont Aves., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster, Pike and Mariemont Aves., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co., (Arc) 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

GOGGLES

American Optical Co., Southbridge, Mass.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mich. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.

(Continued on page 328)



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Eliminate "high-cost-specials" by standardizing on

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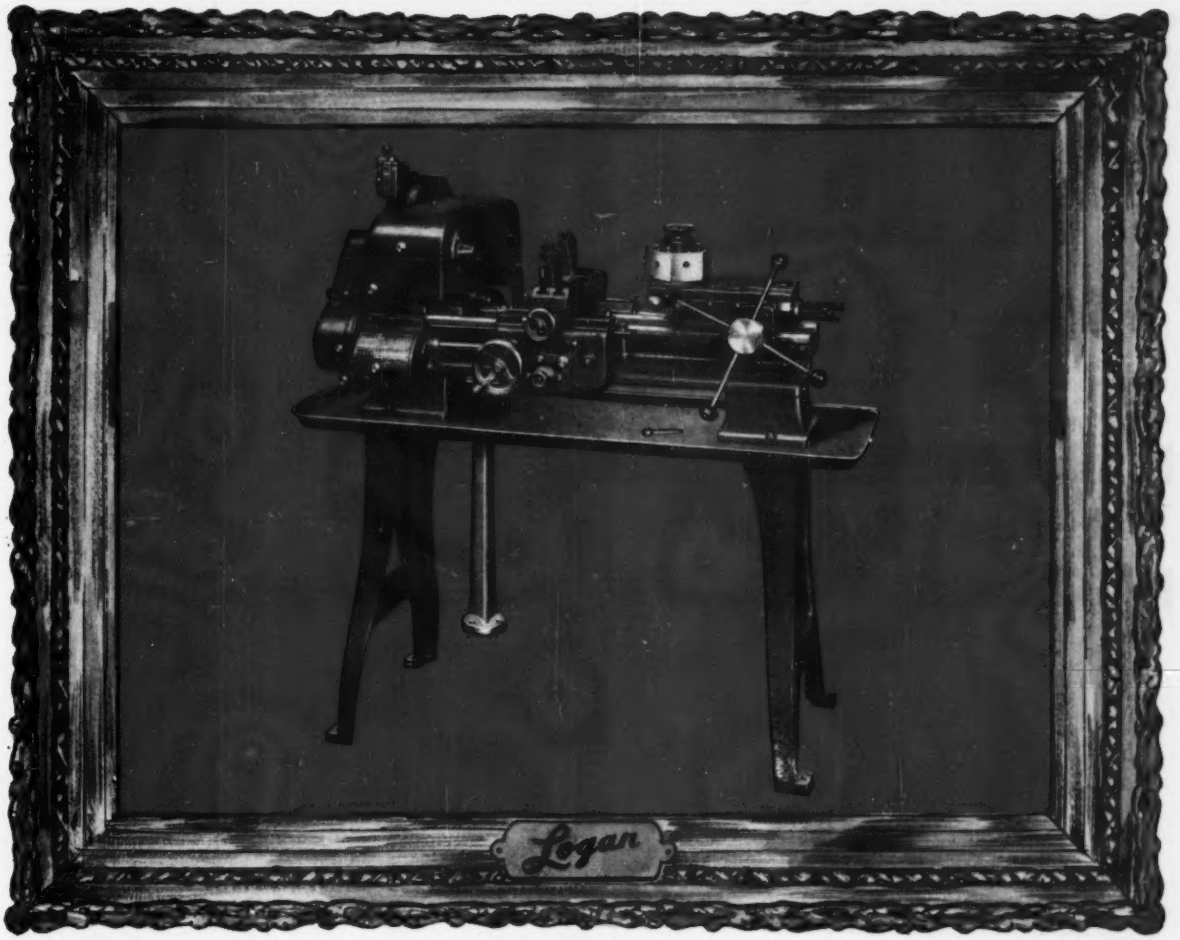
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Logan 940-2
Quick Change Gear
Turret Lathe
11" Swing, 1" Collet Capacity,
1⅜" Spindle Hole

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THE *Logan* LATHE

Puts Profit In Production

Industry's respect for the Logan Lathe as a metal-working production tool is not an overnight development. Through the years, Logan Lathes have put many a production line on a profitable basis. Today, with its 11" swing, 1" collet capacity, and 1⅜" spindle hole, the production efficiency of the Logan Lathe is being used on a wider scale than ever before.

The Logan is easily set up for every type of lathe turning operation. The Logan ball bearing mounted spindle has the sustained accuracy at high speeds to hold precision tolerances. The lasting accuracy and rugged durability of Logan construction keep production going at top efficiency, at minimum cost per finished part. For the production line, tool room or machine shop, no other lathe of comparable specifications can match the Logan in economy.

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4901 West Lawrence Avenue, Chicago 30, Illinois

Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St, New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

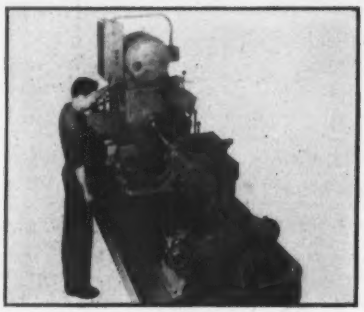
GRINDERS, Pneumatic

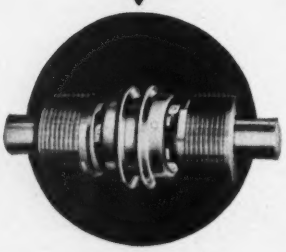
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Millers Falls Co., Greenfield, Mass.
Skilsaw, Inc., 5033 N. Elston St., Chicago, Ill.

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The Lodge & Shipley DUOMATIC LATHE features independently actuated front and rear carriages and tool slides; permitting simultaneous or independent operation of the front and rear cycles, ROCKFORD CLUTCHES both drive and brake the main headstock drive. Let ROCKFORD clutch engineers help plan versatile power transmission controls for your machines.

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GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Madison Mfg. Co., Muskegon Heights, Mich.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Porter-Cable Mch. Co., Salina St., Syracuse, New York.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Atlas Press Co., 1253 N. Pitcher Ave., Kalamazoo, Mich.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Machine Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Landis Tool Co., Inc., Waynesboro, Pa.

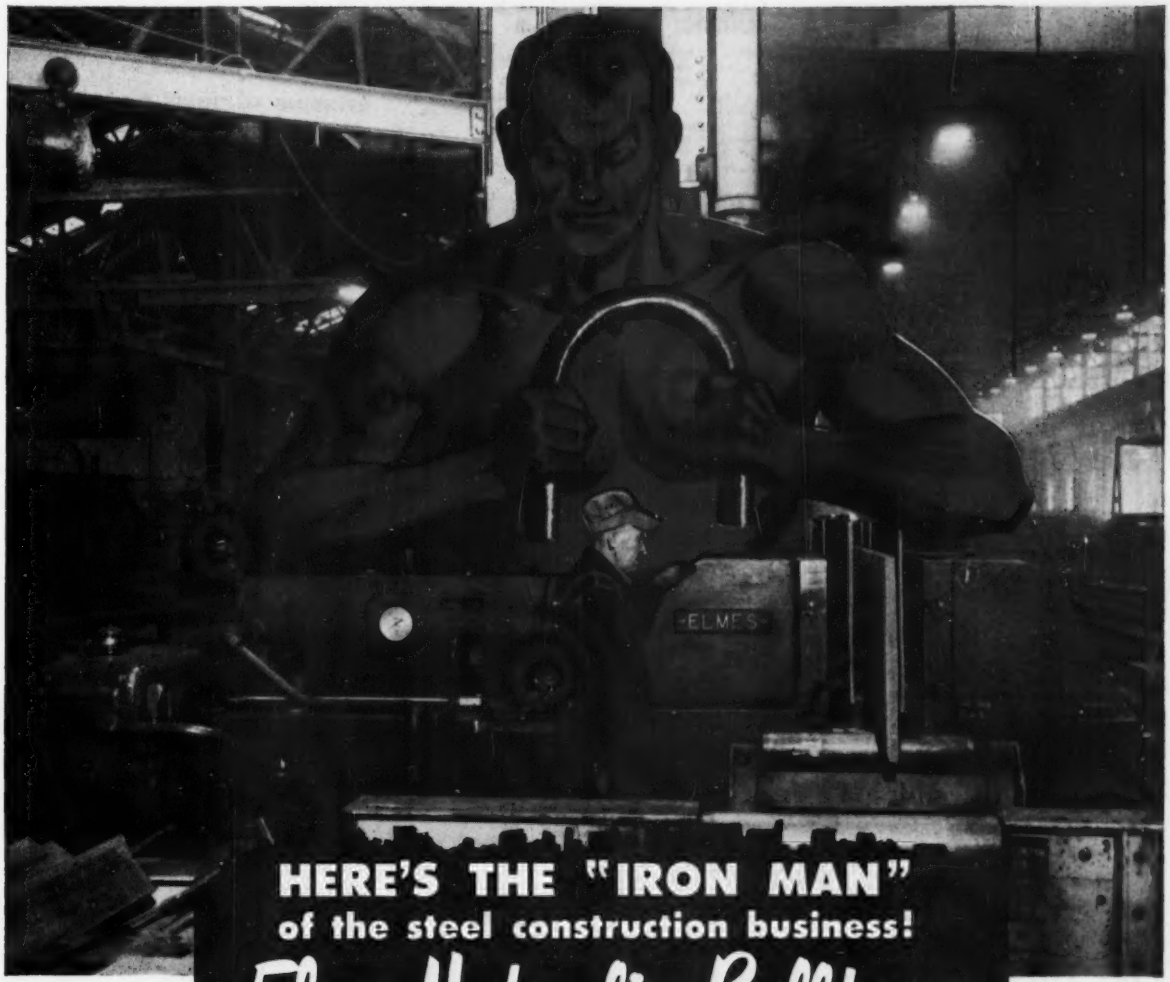
GRINDING MACHINES, Crankshaft

Landis Machine Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Dumore Co., 1300 17th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.

(Continued on page 330)



HERE'S THE "IRON MAN" of the steel construction business!

Elmes Hydraulic Bulldozer

Shown in operation is a 200-Ton Elmes Hydraulic Bulldozer, working in the shop of one of the country's larger steel construction companies. This customer reports his Elmes Bulldozer *"has been busy without interruption since it was installed . . . has performed a tremendous amount of bending and straightening work . . . turned out a greater number of pieces than ever anticipated."*

There are sound reasons why Elmes Hydraulic Bulldozers receive such enthusiastic recommendations. They're built rugged for rugged work — heavy bending, forming, straightening. Bed and frame are of simplified, solid design, using bolted and keyed construction of structural steel. And the design is *clean*. Top of the press is clear—free from obstructions. Pumping unit is located low, at the end of the press. The press is protected. You can bring work to the press—position it quickly, from an overhead traveling crane. Head is adjustable for varying the work space opening.

Elmes Hydraulic Bulldozers are available in capacities up to 500 tons, with bed size, stroke and speed optional to suit your requirements. Your Elmes distributor can give you full details on these versatile presses and on the complete line of Elmes Hydraulic Metal-Working Presses. See him now—or write us for Bulletin No. 1010 B.

American Steel Foundries

ELMES ENGINEERING DIVISION

1163 TENNESSEE AVENUE CINCINNATI 29, OHIO

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS — ALSO MANUFACTURED IN CANADA

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Sheffield Corp., 721 Springfield, Dayton, Ohio.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.

GRINDING MACHINES, Drill

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Union Twist Drill Co., Athol, Mass.

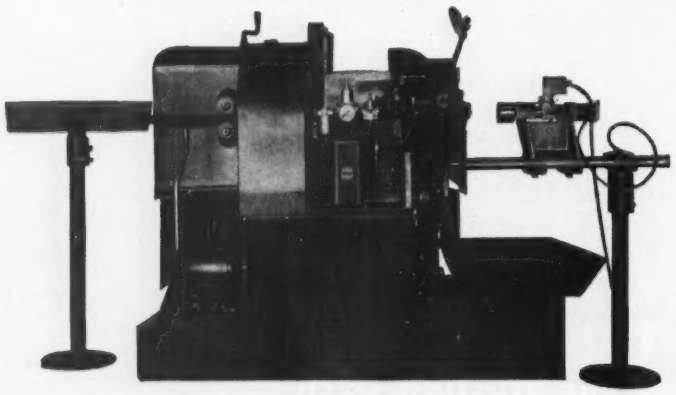
GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

The NEW MODERN AUTOMATIC
CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off *any length you want*—and cuts it *faster*. If your production *requires* quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing

This machine cuts off and chamfers both outside edges of ½" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

1 1/4" Cold Rolled

This machine cuts off and chamfers both ends of 1¼" cold rolled, 20" long, at the rate of one every 20 seconds.

1" Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

4" Threaded Studs



Cut and chamfered at one time—in 8 seconds—from 10 ft. length of stock already threaded. (¾" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

WRITE FOR ILLUSTRATED CATALOG.

MODERN MACHINE TOOL CO.
Jackson, Michigan

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines.

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
British Industries Corp., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave, New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614 G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.

(Continued on page 332)

TWO NEW

HUFFORD

MACHINES

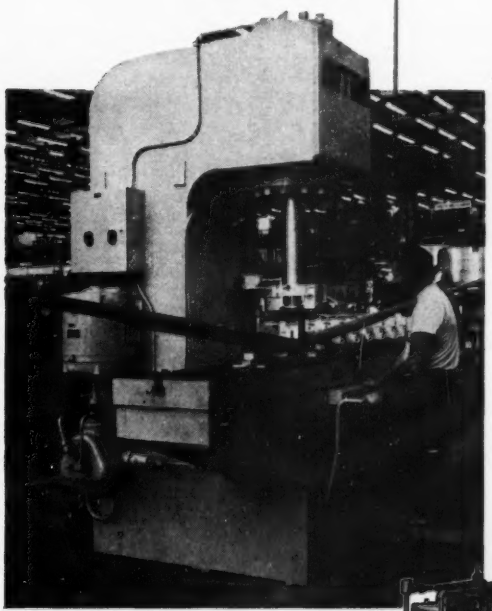
with special features insuring

FASTER STRAIGHTENING

QUICKER BULLDOZING

HUFFORD PRECISION HYDRAULIC PRESS

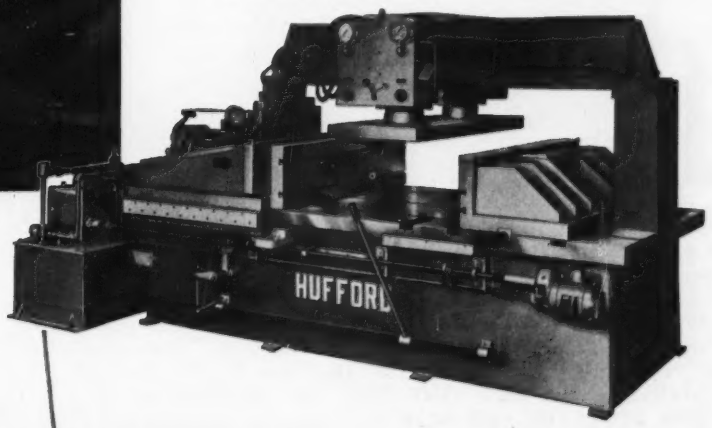
removes the risk of "over-correcting" on ticklish straightening jobs. Equipped with the Automatic Stroke Limiter, the ram is under positive control at all times, automatically comes to a halt at any pre-established setting . . . can't run wild! Ram stroke is varied by means of a graduated handwheel on the face of the press and will repeat with unerring accuracy. Applied force is indicated on a dial gauge and ram travel is read on a counter to .010" from any starting position.



HUFFORD METAL FORMING BULLDOZER

saves hours of valuable production time and relieves bulldozer operators of unnecessary drudgery. This bulldozer offers two outstanding advantages:

The pressing ram is equipped with the Automatic Stroke Limiter described above which gives new control protection. In addition, two overhead cylinders provide 25 tons of clamping force each, firmly maintaining position of top pressure plates on dies during metal forming operations. When cylinders release, work is quickly removed from dies without the usual unbolting and re-bolting delays. Complete overhead track and clamping assembly is quickly removeable for conventional applications. Both the Hufford Straightening Press and the Bulldozer were specially designed to successfully lick problems common to aircraft production.



CUSTOM-BUILT MACHINE TOOLS

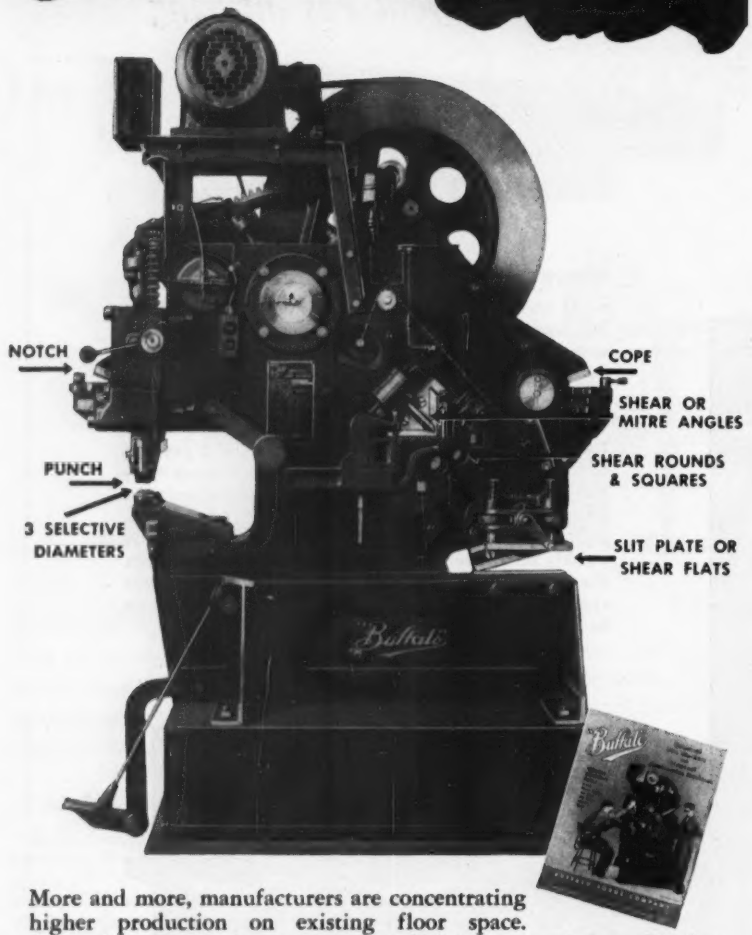
Hufford offers its engineering staff, experience and manufacturing facilities for the development of special custom-built machinery. Why not submit your problems for discussion?

HUFFORD
Machine Works Inc.
EL SEGUNDO CALIFORNIA

Manufacturers of

"Buffalo" Tips on Metal Working

WHY BUY 5 MACHINES WHEN 1 WILL DO THE JOB?



More and more, manufacturers are concentrating higher production on existing floor space. A good example of this is the "Buffalo" Universal Iron Worker shown. Without tool changes, this fast, rugged machine does up to FIVE operations. Takes the space of ONE machine. Does it save time? One shop's Universal Iron Worker now does in ONE HOUR fabrication that took ONE DAY by other methods. WRITE FOR BULLETIN 360E NOW for complete information on the 7 sizes and 5 styles to choose from—for LOWER COST FABRICATION!

"Buffalo" MACHINE TOOLS

DIAMOND JUBILEE 75TH ANNIVERSARY

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440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

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Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Radial, Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Kelvin System Corp., 135 Front St., New York 5, N. Y.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
British Industries Corp., International Machinery Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gallmeyer & Livingston Co., 336 Straight Ave., S.W., Grand Rapids 4, Mich.
Gardner Machine Co. (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

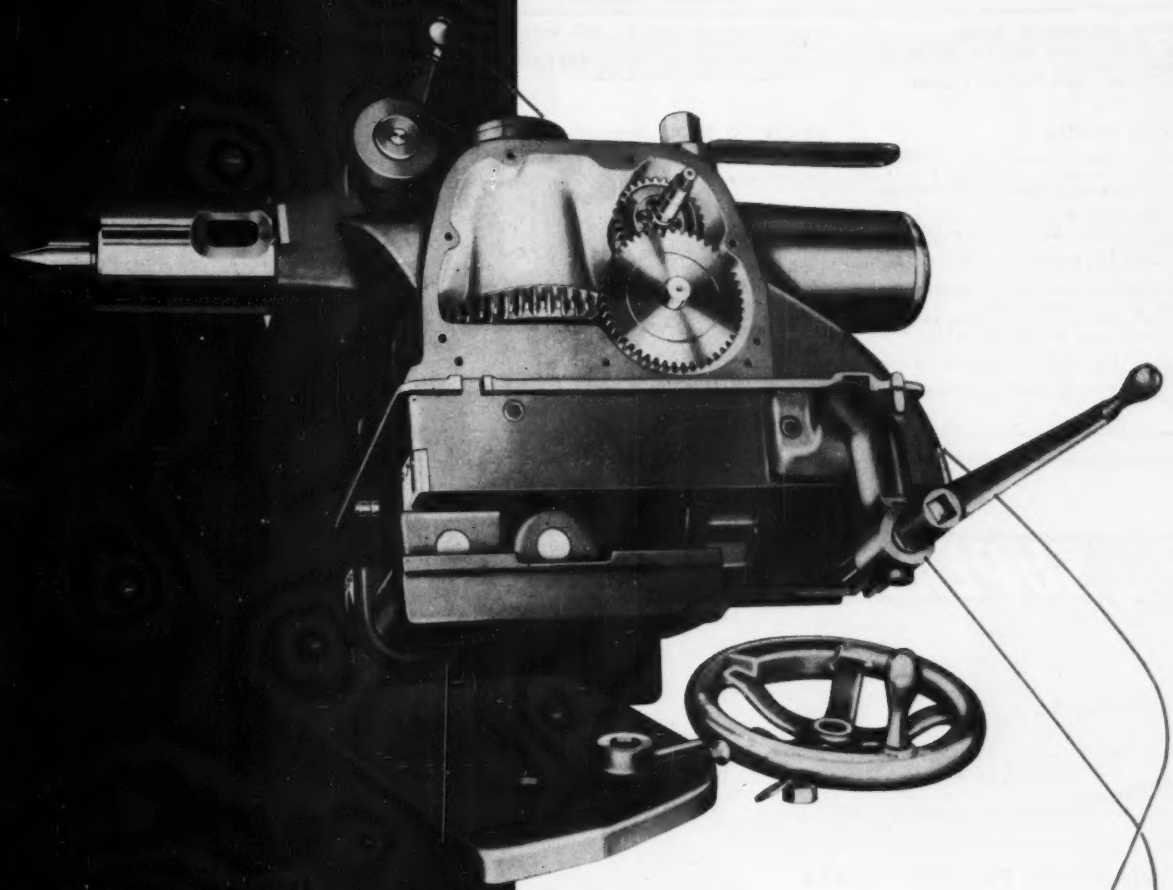
GRINDING MACHINES, Thread

Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Landis Tool Co. (Centerless), Waynesboro, Pa.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

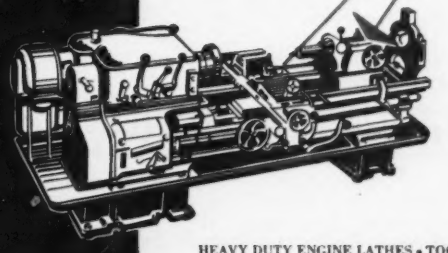
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

(Continued on page 334)



AXELSON'S TWO-SPEED TAILSTOCK

The Axelson Tailstock, originally patented by Axelson, is a 2-speed unit with a high-low gear ratio, providing the operator with a time saving operation in drilling, and enough power to use the largest drills fitting its spindle, without the necessity of using additional leverage — unlike the conventional tailstock. • The hand wheel, situated directly in front of the operator, permits a longer tailstock spindle travel at one setting than others with the single screw and hand wheel positioned at the rear end of the tailstock body. • The hardened and ground alloy steel spindle is lapped into the bore of the body, leaving only that clearance needed for a sliding fit. • One of the most needed features is provided in the Axelson tailstock spindle — a drill tang slot for positive holding of the drill. • This tailstock is held to the bed by a cam locking clamp, permitting an overhang of several inches. • On Axelson 20", 25" and 32" lathes a stationary ratchet type rack is cast integral with the bed center. Bracing of the tailstock is accomplished by dropping a pawl into the ratchet making slippage of the body impossible. • Accurate hand scraping and fitting is given the Axelson tailstock to bring it into proper alignment with the headstock to insure straight and accurate machining regardless of its position on the bed. • So it is throughout all Axelson lathes. Quality built, they deliver dependable precision work under the most difficult operating conditions. • **Send for Bulletin 5001.**



AXELSON Lathes

HEAVY DUTY ENGINE LATHES • TOOL ROOM LATHES • GAP BED LATHES

AXELSON MANUFACTURING COMPANY, 6160 S. BOYLE AVE., LOS ANGELES 58, CALIF.

Authorized Distributors in All Principal Industrial Centers

OUR 60th YEAR

Chosen first ... to last

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div. Cincinnati, Ohio.
Gardner Machine Co. (Div. Landis Tool Co.), (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill. (Diamond).
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HAMMERS, Steam

Chambersburg Engrg. Co., Chambersburg, Pa.

HARDENING EQUIPMENT

Lepel High Frequency Laboratories, Inc. (Induction), 55th St. and 37th Ave., Woodside 77, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDNESS TESTING INSTRUMENTS

Ames Precision Mch. Wks., Waltham, Mass.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 No. Madison, Rockford, Ill.

HEAT-TREATMENT OF METALS

Bennett Metal Treating Co., Elmwood, Conn.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

(Continued on page 336)

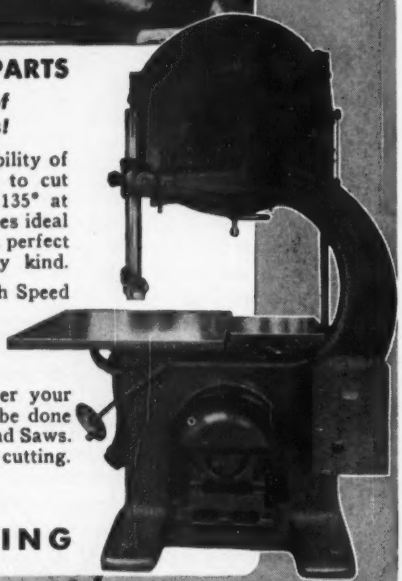
The SUPER METHOD



of TRIMMING FORMED PARTS
and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.





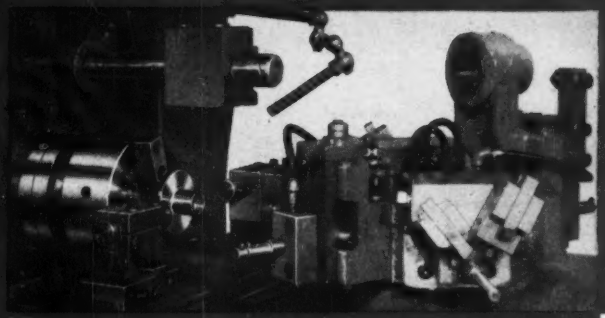
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

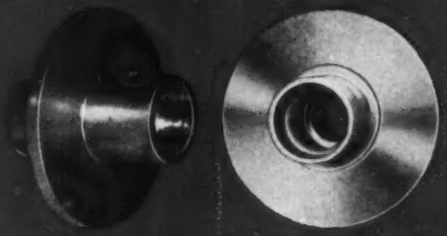
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THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Lower UNIT COSTS

FOR COMPLEX PRECISION PARTS



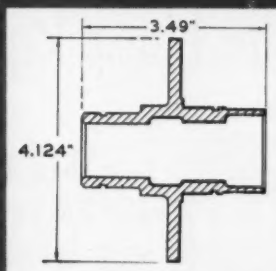


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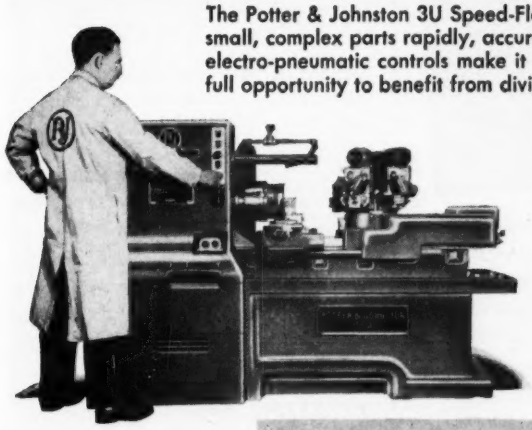
POTTER & JOHNSTON

3U *SPEED-FLEX*

Automatic Turret Lathe



All the surfaces of this steel forging (indicated by heavy lines) were precision machined in one operation.



The Potter & Johnston 3U Speed-Flex Automatic Turret Lathe is specifically designed to machine small, complex parts rapidly, accurately and economically. Completely automatic operation and electro-pneumatic controls make it easy for one man to handle several machines, affording you full opportunity to benefit from divided labor costs. High spindle speeds and ample power take full advantage of fast-cutting carbide tools. Rugged, rigid, high precision construction assures long life, lasting accuracy and a full return on your investment. Meet today's demand for greater output at lower cost with a Potter & Johnston Automatic Turret Lathe equipped with expert P&J Tooling.

See for yourself how the 3U Speed-Flex can bring new standards of efficiency and economy to your difficult chucking and turning jobs. Send today for your copy of Bulletin 145 that contains complete data, specifications and a pictorial description of the Model 3U and all its advanced engineering features.



POTTER & JOHNSTON COMPANY

PAWTUCKET, RHODE ISLAND

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HOISTS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.

HOISTS, Chain, Etc.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

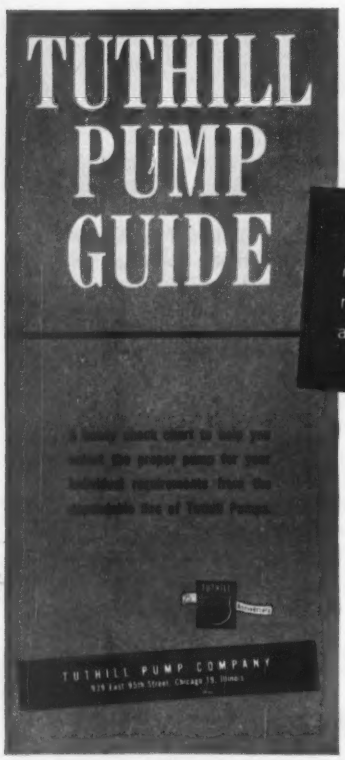
HONES
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.

HONING MACHINES, External
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HONING TOOLS AND FIXTURES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
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Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

HYDRAULIC POWER UNITS OR TOOL HEADS
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

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Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed
Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

INDICATORS, Test
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
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(Continued on page 338)

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Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Lepel High Frequency Laboratories, Inc., 55th St. and 37th Ave., Woodside 77, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

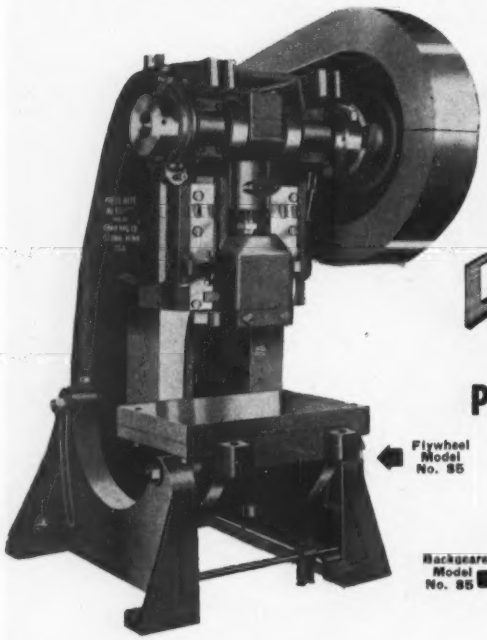
JIG BORER

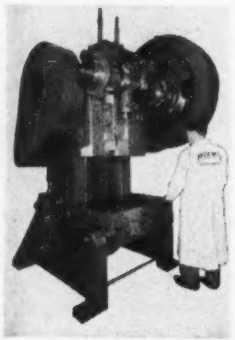
See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.

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Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

JOINTS, See Fittings, Hydraulic, Pneumatic, Etc.

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 225 Mill St., Rochester, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.

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Pratt & Whitney, West Hartford 1, Conn.

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Pratt & Whitney, West Hartford 1, Conn.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
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American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Torrington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turnomat Co., Inc., Brockport, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.

(Continued on page 340)

On assembly line operations . . .

ARE YOU PAYING FOR WASTE MOTIONS?



QUALITY, PRODUCTION-engineered EATON Springtites and Sems (bolts or thread-cutting screws with pre-assembled Reliance spring lock washers or multitooth washers) cut assembly motions for hundreds of users. In fact, in actual use, they cut these assembly motions from 8 to 3! Here's real economy on your assembly line operations. All the engineering data and samples you require for a trial test can be obtained by writing us today.

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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

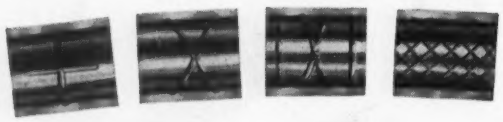
Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Ames Precision Mch. Works, Waltham, Mass.
Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

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CONTINUOUS OIL GROOVING



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PIECES PER HOUR!

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SINCE 1868

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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
Hendey Machine Co., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Cincinnati 25, Ohio.

(Continued on page 344)

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ARMSTRONG TOOL HOLDERS

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Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

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● Look almost anywhere in Studebaker's vast plant at South Bend, Indiana, and you'll see Standard's lubrication service at work.

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All along Studebaker's assembly and production lines, you'll find Standard Oil products at work. From one of the most complete lines of fuels and lubricants on the market, Studebaker has been able to select the petroleum products that exactly fit its needs.

All of these benefits—expert engineering service, fast and reliable deliveries, a complete line of high quality products—add up to one of the reasons why Studebaker has been a Standard Oil customer for over 50 years. Make Studebaker's experience the basis for putting Standard's lubrication service to work for you. Just phone your local Standard Oil (Ind.) office and ask to have the Standard Oil lubrication specialist in your area call on you.

What's YOUR problem?



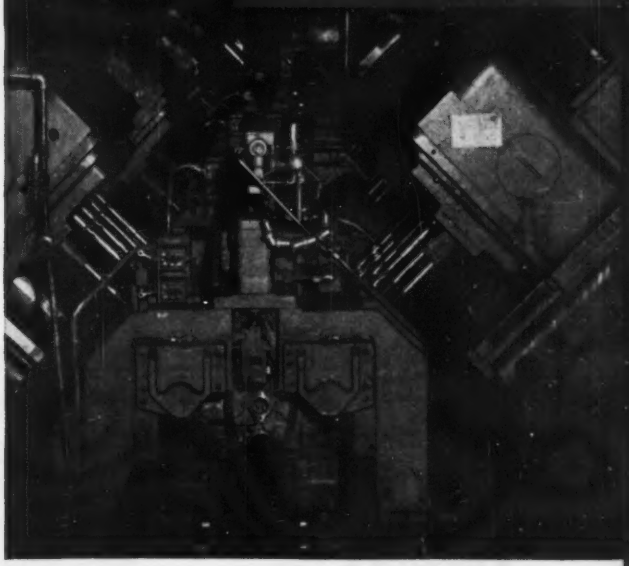
Russ Jenkins (left), lubrication specialist from Standard's South Bend office, and Studebaker's Paul Izdepski work closely together to get best results from Standard's fuels and lubricants.

Wherever your plant is situated in the Midwest, there is a Standard lubrication specialist close-at-hand who will work hand-in-hand with you on lubrication problems. Right in your neighborhood, too, you'll find a Standard office and warehouse. It makes immediately available to you a reliable supply of petroleum products. Phone your local Standard office soon, and find how you can profit through Standard's unique industrial lubrication service.

STANDARD

STANDARD OIL COMPANY
(INDIANA)

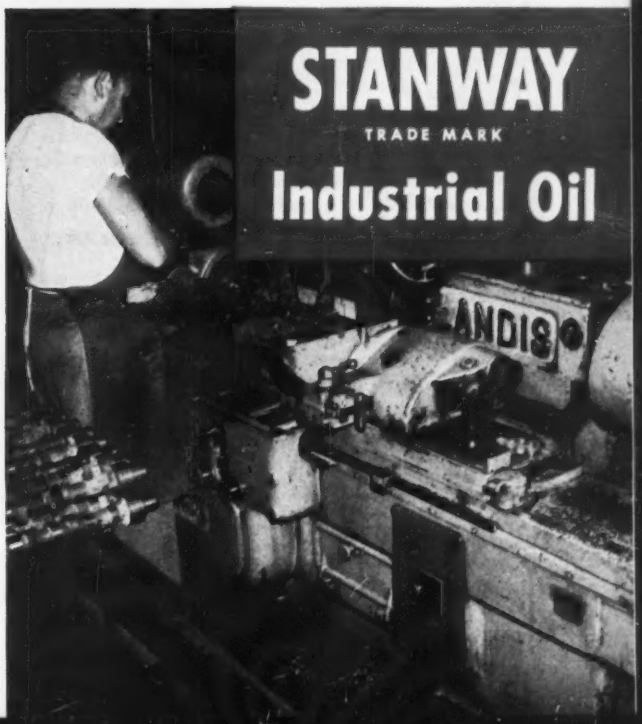
STANOBAR
TRADE MARK
Grease



STANOBAR GREASE is used throughout the Studebaker plant for lubrication of bearings in electric motors and oil pumps. Its high stability enables it to provide effective lubrication under a wide variety of operating conditions.

In Studebaker's many grinding machines, such as the one shown below, STANWAY Industrial Oil No. 30H answers a special need by serving both as a hydraulic oil and as a lubricant for ways and guides. The high stability necessary in a hydraulic oil and the oiliness needed in a way lubricant are uniquely combined in STANWAY.

STANWAY
TRADE MARK
Industrial Oil



Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.



British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc. (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Murad Developments Ltd., Aylesbury, Bucks, England.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lehmann, J. M., Co., Inc., 55 New York Ave., Lyndhurst, N. J.
Rogers Machine Works, Inc., Buffalo 10, N. Y.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.

LOCKNUTS

Standard Locknut & Lockwasher, Inc., 510 N. Capitol Ave., Indianapolis, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Pure Oil Co., 35 E. Wacker Driver, Chicago, Ill.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

LUBRICATING SYSTEMS

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Farval Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Tap, Etc.

MANDRELS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

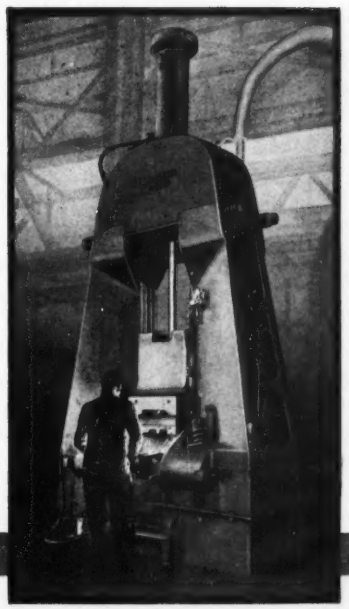
(Continued on page 346)

CECO-DROP *Forgings*



prove a point . . .

And that point is that the CECO-DROP Piston Lift Gravity Drop Hammer almost invariably sets new production records and cuts forging costs wherever installed.



A Feeder Bar for Sewing Machine. Formerly forged on a board drop hammer. Transferred to a similar weight Ceco-Drop, production increased 20%.

B Tank Hook—forged two at a time from round cornered square stock. Production increased 20% when made on 2500 lb. Ceco-Drop.

C Mine Bit-Forging is made of tough steel 2⅜" in dia. Unusual length requires accurate die match in passing through 3 die impressions.

D 12" Adjustable Wrench forged from bar stock, 7% increase in production when made on Ceco-Drop.

These are but a few of the many examples we could use showing how production improves when a Ceco-Drop piston-lift, gravity-drop hammer replaces a regular board drop hammer—and how the cost per piece goes down. Ceco-Drop Hammers are the result of over a half century of experience in the design and manufacture of drop hammers. Ceco-Drops cost less to operate, they forge more and the production improvement is notable. Inquire today about Ceco-Drop Hammers. Ask for a copy of Bulletin 11-L-O.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CHAMBERSBURG

THE HAMMER BUILDERS

MEYCO

CARBIDE INSERTED DRILL JIG BUSHINGS



*PATENTED

☆ Combining the best features of steel and carbide—here is the answer to increased production and to tough drilling problems: MEYCO Carbide Inserted Drill Jig Bushings.

MEYCO bushings last as long as solid carbide bushings in most cases and cost a great deal less—they will increase the life of drill jigs, fixtures, drills and reamers—they will maintain accuracy for a much longer period of time—they will increase production, save you money in machine-down time, lost man-hours and less spoilage.

MEYCO bushings are made to A.S.A. Standards in Headless Press Fit, Head Press Fit and Fixed Renewable Types. MEYCO Bushings can also be adapted to many special applications—write for fully informative catalog No. 30 today.

Manufacturers of precision tools since 1888

W. F. MEYERS CO., INC.
BEDFORD, INDIANA

MEASURING MACHINES AND INSTRUMENTS, PRECISION

Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Norma-Hoffmann Bearings Corps., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Bath, John, Co., Inc., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.
Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio
Porter-Cable Machine Co, Salina St., Syracuse, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

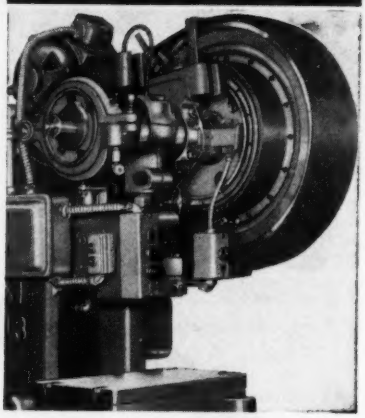
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

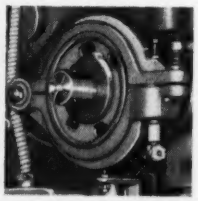
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.

(Continued on page 348)

MORE Speed – Safety Production with L & J - FAWICK AIR CLUTCHES



Here's the answer to more production — L & J Presses equipped with L&J-Fawick Air Clutches and variable speed drives. This unbeatable combination gives you maximum speed for each operation — often 2-1/2 to 3 times normal production, greater safety through rapid, shock-free, full-power operation. Let us show you how these L & J Presses can increase your output of high-speed press work and cut down operating cost.



NEW

AIR RELEASE SPRING-SET BRAKE

Another important L&J safety feature. Brake automatically applied if air pressure fails — positive, foolproof.

L&J Presses are made in 12 O. B. I. models—back geared and plain flywheel types—8 sizes from 6 to 80 ton capacities. *Write for literature.*

L&J PRESS CORPORATION
1631 STERLING AVENUE
ELKHART, INDIANA



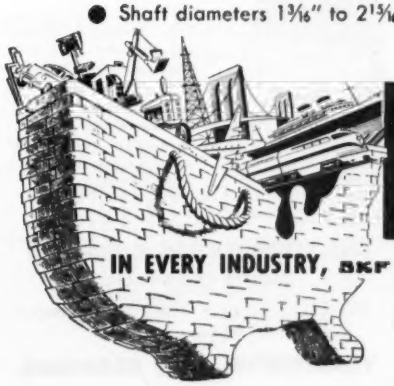
NEW from SKF

the HESS-BRIGHT "SY" UNIT PILLOW BLOCK

A new Unit Pillow Block, designed by SKF to meet tomorrow's needs of modern industry.

Here are the design features:

- SKF Red Seal, made of DuPont Fairprene, retains lubricant. Wiping action of the seal against the inner ring is practically frictionless.
- Rotating flingers exclude dirt.
- Set screws for ease of installation.
- Spherical outer ring compensates for initial misalignment.
- Alemite fitting for re-lubrication.
- Interchangeability with existing installations made possible by bolt hole spacing and center height features.
- Shaft diameters 1 3/16" to 2 15/16".



Detailed illustration of rotating flinger and RED SEAL—the extremely light tension contact seal.

SKF®
BALL AND ROLLER BEARINGS

IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

From now on, the name to remember in Unit Pillow Blocks is HESS-BRIGHT "SY"—manufactured in our plants, to the same high quality standards as all SKF products. Ask your SKF Distributor to show you the HESS-BRIGHT "SY"; or write SKF direct for complete information on this *newest* Unit Pillow Block.

SKF INDUSTRIES, INC., Phila. 32, Pa.—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7312-A

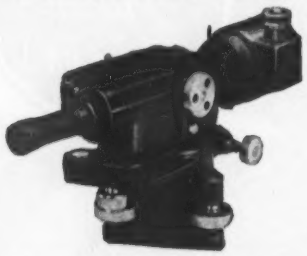
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TOOLING

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ALIGNMENT
TELESCOPE



For point alignment, with built-in optical micrometers—.001" direct reading—and for precise square setting. Available with target plugs, collimating unit and auto-reflection accessories. Shown with prismatic stride level and sphere adaptor.

MICROPTIC LEVEL B131A



With built-in optical micrometer—direct reading to .001". Fully erect image.

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EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Ill.

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis. Rockford, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engineering Co., 3400 East Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 50 Church St., New York, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Marac Mchry. Corp., 1819 Broadway, New York, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 350)



pointing
problems?

Torrington Swaging Machines produce pointed ends on both solid and tubular work to close tolerances. The swager, delivering 4000 hammer blows a minute, works rapidly and gives the metal toughness and resiliency. Swaging is economical, too, for there is no stock waste.



"The Torrington Swaging Machine" tells the story on the art of swaging, and describes the complete line of Torrington machines. This informative booklet is yours for the asking.

THE TORRINGTON COMPANY
Swager Department
558 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

SKF  RACES *Against Time...*

with the new

GISHOLT NO. 24 HYDRAULIC AUTOMATIC LATHE

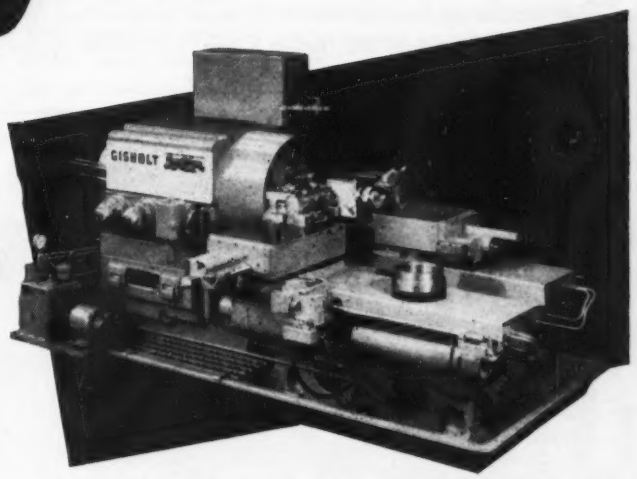
When it comes to fast production of top quality spherical roller bearing races, SKF doesn't fool.

These new Gisholt No. 24 Hydraulics remove 34 lbs. of metal in two operations in a total of only 2.80 minutes' machining time on each of two machines. All cutting is on 52100 bearing steel and done at speeds of 325 to 350 f.p.m.

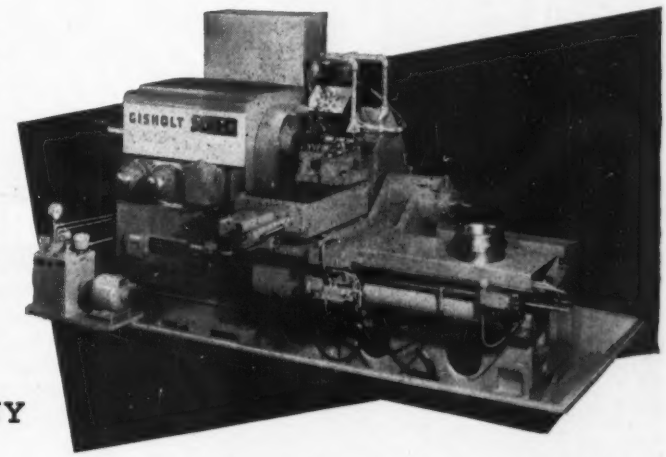
Speed is important, of course. But precision is the governing factor. How the Gisholt No. 24 does the job is a story that might mean real savings for you, too.

The No. 24 Hydraulic Automatic Lathe is a larger version of the famous No. 12 that has an outstanding success record on hundreds of jobs. If you have large volume precision work up to 24″ diameter, the Gisholt No. 24 is the machine to investigate. Write for full information.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



First Operation: Chucked on OD with 3-jaw hydraulic chuck, part is turned up to the jaws, faced, chamfered, bored and bore radius formed. Cam relief on rear tool block turns boring bit clear of workpiece as it is withdrawn.



Second Operation: Part held on expanding arbor by hydraulic pressure is finish turned, faced, chamfered and bore radius formed. Special rocker arm type carriage at rear tips in shaving tools to form both roller grooves with feed of .003″ to .0045.″

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*



TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MILLING MACHINES, Planer Type

Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Marac Mchry. Co., 1819 Broadway, New York N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.

MOLYBDENUM

Climax Molybdenum Co., 500 5th Ave., New York, N. Y.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co. Div., Republic Steel Corp., Massillon, Ohio.

(Continued on page 352)



Specialists IN "Specials"

"Specials" are ball bearings which have been custom designed to be "exactly right" for a particular application. Thus, the field for specials ranges from modification of existing standard bearings to complete new bearings of unusual shapes and dimensions. As "specialists in specials," experienced NICE engineers take advantage of every design opportunity to reduce costs without sacrifice of quality and to improve product performance and appearance.

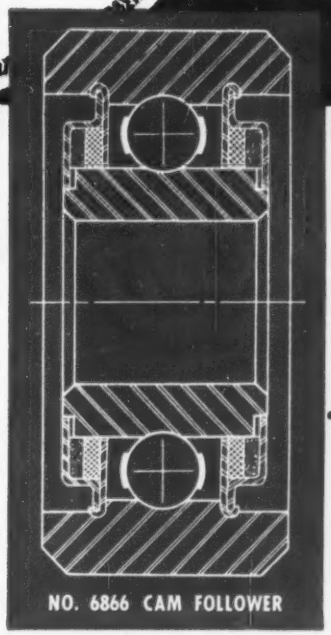
SPECIAL BEARINGS

of unusual shapes and dimensions

Representative of Nice ingenuity is No. 6866, a cam follower on an agricultural harvester. No. 6866 replaces a precision bearing pressed into a specially machined outer tire . . . and the resulting improvements were:

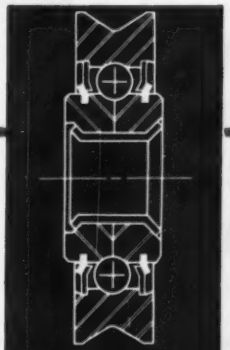
1. **LOWER COST (OVER 30% SAVINGS).**
2. **INCREASED CAPACITY.**
3. **MORE EFFECTIVE SEAL.**
4. **PACKAGED INTERCHANGEABLE UNIT.**
5. **IMPROVED APPEARANCE AND PERFORMANCE.**

Characteristic of agricultural machinery, severe dust and dirt problems dictated the need of an efficient and rugged seal. No. 6866 seal has proved to be highly effective and durable.



NO. 6866 CAM FOLLOWER

Where new tooling is justified by the quantities involved, specials of this type, where applicable, offer the greatest possibilities for cost savings and product improvement. A few typical application examples are illustrated.



No. 6750
BALING MACHINE
WIRE GUIDE

SEMI-PRECISION "SPECIALS"



No. 6757
PRESSURE
BEARING
FOR
LOCATING
INSTRUMENT
RECORDING
CHART

Many precision bearing applications do not require all of the elements of precision that are normally incorporated in a standard precision unit. For example, if the bearing cone is locked against a step on the shaft, grinding of the bore can be eliminated and will save approximately 10% of the selling price of a 2" OD precision annular bearing. Similarly, if the loads are not severe nor the RPM excessive, polishing of the ball grooves may not be necessary and will reduce the cost about 10%. In a light load application, the outer ring material can be changed to a less expensive steel at a savings of as much as 8% of the selling price.

THE USE OF SEMI-PRECISION BEARINGS, WHERE INDICATED, MAY REFLECT SUBSTANTIAL SAVINGS TO THE MANUFACTURER WHO BUYS BEARINGS IN PRODUCTION QUANTITIES.

NICE

NICE BALL BEARING COMPANY
NICETOWN · PHILADELPHIA · PENNSYLVANIA

HERE IS A POSITIVE METHOD THAT

Eliminates

ALL ERROR

ALL CHANCE

ALL UNCERTAINTY

WHEN YOU BUY TOOLS AND DIES!



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Yours for the asking — this graphic story of B. Jahn supremacy! Here's how it is achieved — how it can benefit you with PRODUCTION PROVED efficiency, operational ease, tool economy!

From progressive dies or single tools, B. Jahn PRODUCTION PROVES 10 to 50,000 component parts for actual production line use *before the die is shipped!* Error is eliminated! Guesswork ended! Costly adjustments banished! Here is B. Jahn's guarantee . . .

This B. Jahn built die is guaranteed to run in the customer's equipment to his complete satisfaction.

A simple statement known to every B. Jahn customer.

Don't delay! Send NOW for this fact-packed brochure. Discover the dollar saving significance of the B. Jahn slogan . . .

Investigate B. Jahn and Invest in Production Economy!

PRODUCTION B. Jahn PROVED

B. Jahn

THE B. JAHN MANUFACTURING COMPANY • NEW BRITAIN, CONNECTICUT

NUTS, Self-Locking

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OILS, Cutting

See Cutting and Grinding Fluids.

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Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
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Shell Oil Co., 50 West 50th St., New York, N. Y.
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OILS, Soluble

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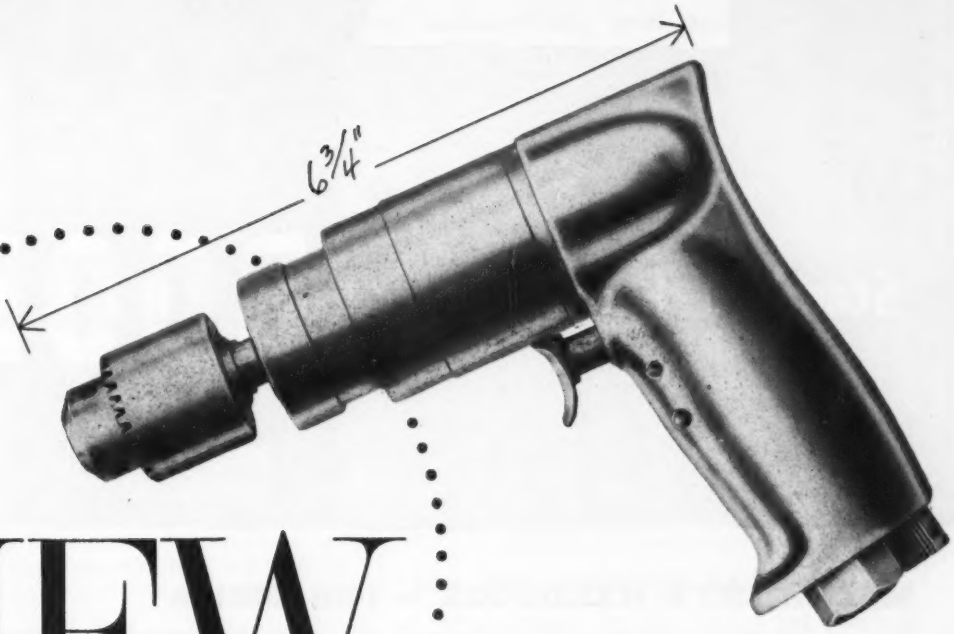
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(Continued on page 356)



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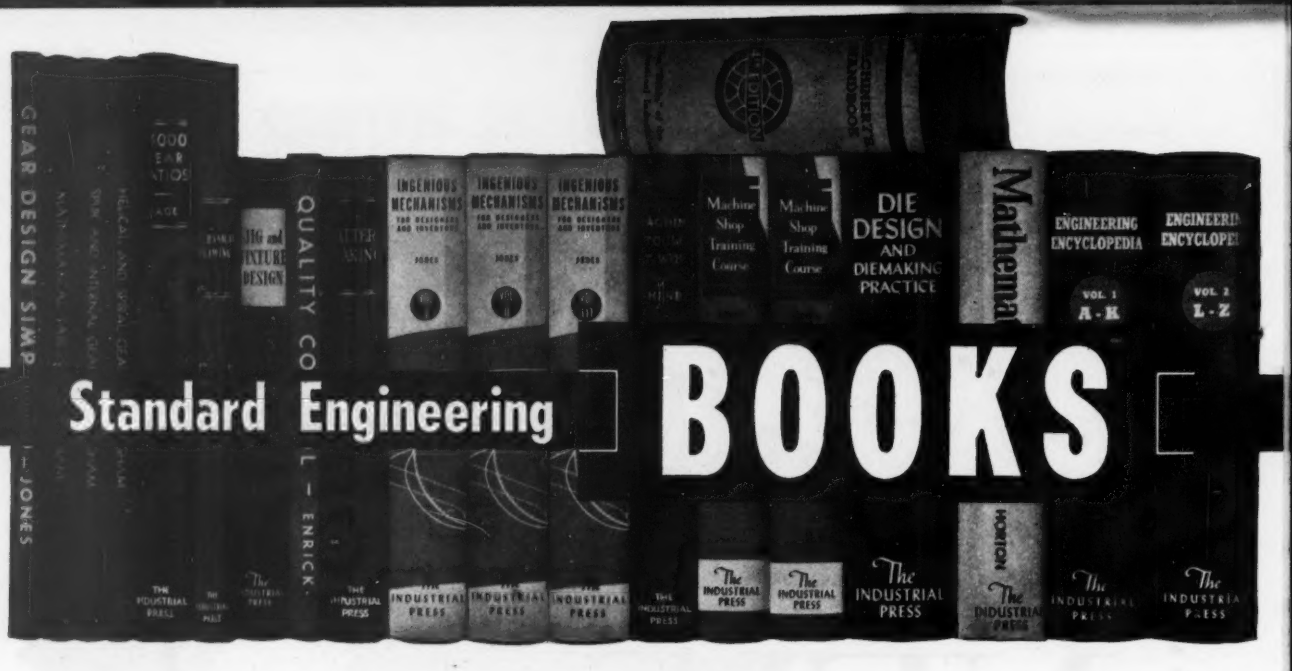
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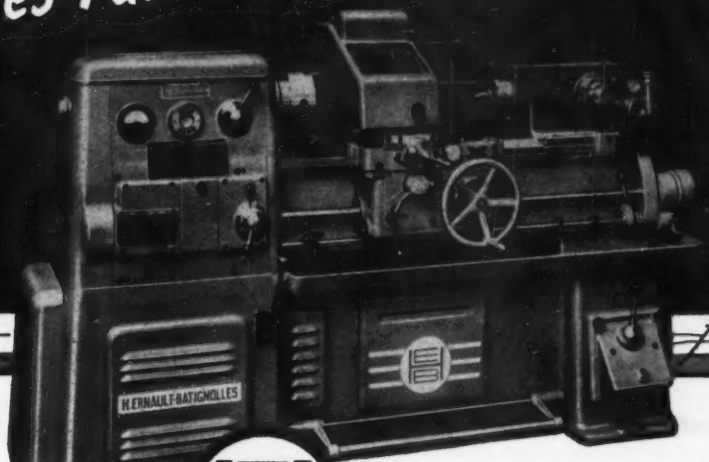
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(Continued on page 358)

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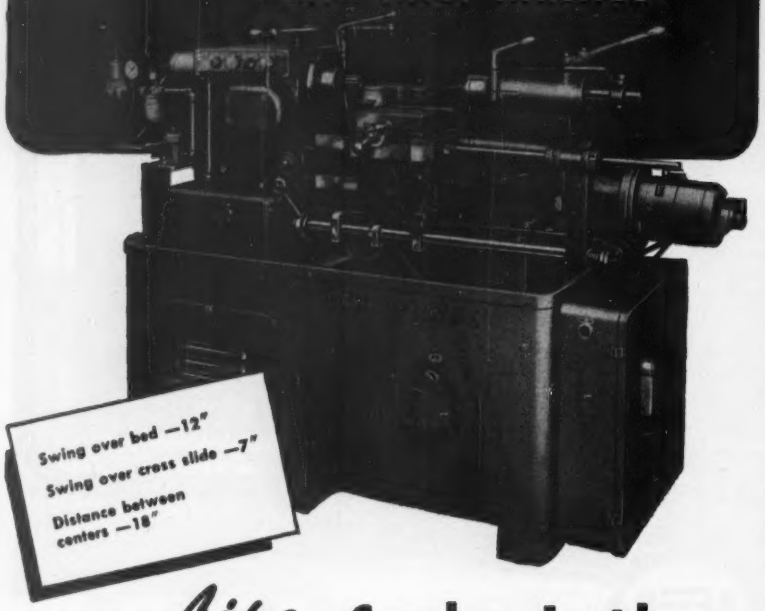
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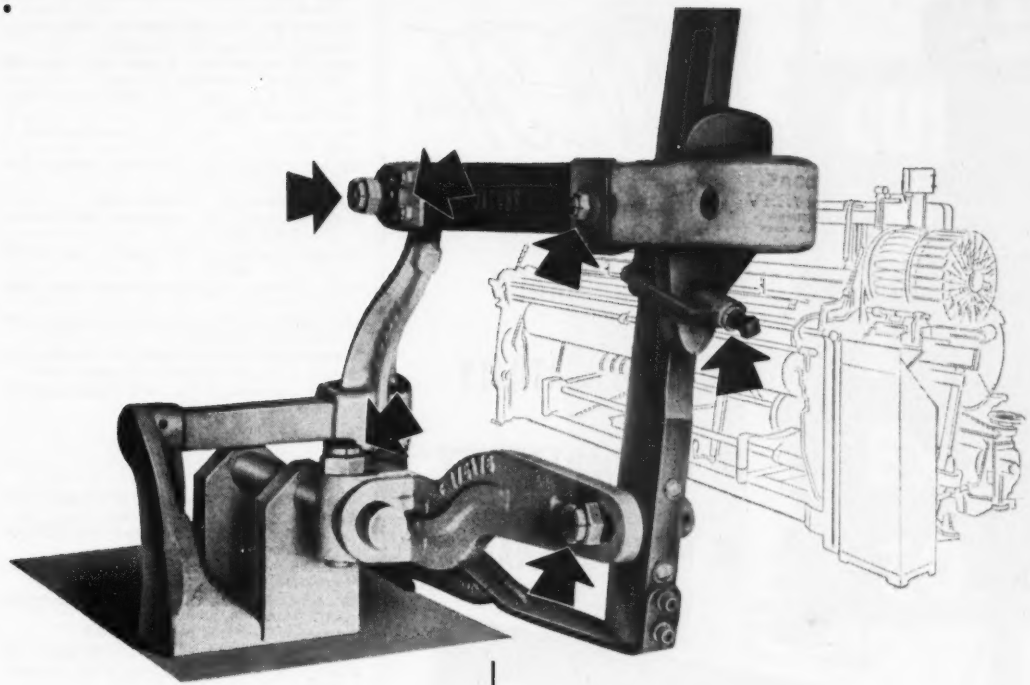
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(Continued on page 360)



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Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Columbia Mchry. & Engrg. Co., Hamilton 1, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Ave., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 1300 18th St., Racine, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

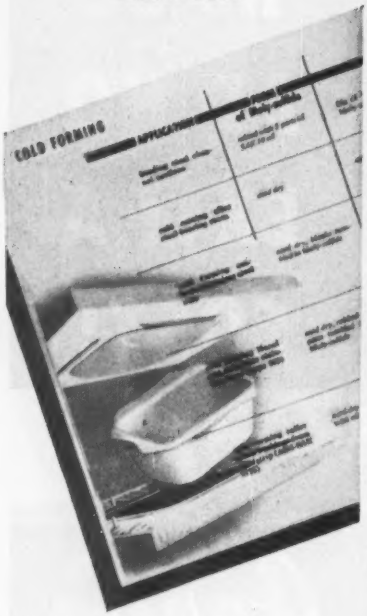
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.

(Continued on page 362)



Moly-sulfide
A LITTLE DOES A LOT

shows up best where the frictional conditions are difficult



The case-histories of 154 difficult friction problems in the shop and in the field, all successfully solved, are described in a new 40 page booklet.

It is where conditions are extreme that ***Moly-sulfide*** excels over other lubricants. If you encounter extreme conditions of pressure, temperature or velocity, send for this free booklet.

Climax Molybdenum Company
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New York City 36 N.Y.



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Position.....
Company.....
Address.....

MOLY

M9 MS-9

Morey Mchry. Co., Inc. (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Vacuum

Leiman, Inc., 156 Christie St., Newark, N. J.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 1300 18th St., Racine, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neill-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

PYROMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

RACKS, Gear Cut

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

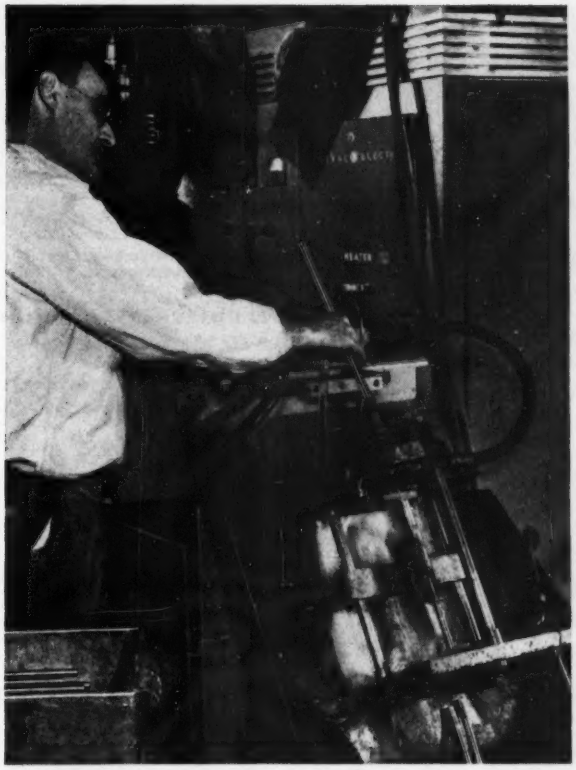
REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(Continued on page 364)





1600 basket shafts are hardened on this machine in an eight-hour shift . . . while this heater silver-solders high-strength joints, three to a cycle.

"VERSATILE G-E INDUCTION HEATERS CUT COSTS 48%" SAYS EASY WASHER

SYRACUSE PLANT SAVES TIME, LABOR, MONEY WITH INDUCTION HEAT

"We cut the entire cost of hardening basket shafts from $.13 each to $.0675 each," says Mr. Victor Barden, General Foreman of the Heat-treat Department at Easy Washing Machine Company. Formerly done by a cyanide process, this operation required three shifts of two men each to harden 1600 shafts. Now, with one G-E induction heater, one man can harden 1600 shafts in an eight-hour shift, releasing five skilled men for other work.

Better hardness characteristics are shown by samples tested after induction heating and quenching. Exact automatic control of heating and quenching times gives uniform hardness to every shaft. In four years of use, the only maintenance cost has been for replacing two electronic tubes.

Versatile G-E induction heaters at Easy are also used for soldering, brazing, and annealing with comparable results. Says Mr. F. L. Taylor, Factory Manager, "We are very pleased with these heaters because they enable us to improve quality and reduce costs on many washer components."

Selective heating for annealing, brazing, soldering and hardening can be done faster and at lower cost by putting G-E induction heaters to work in your plant. For more information, just contact the G-E Sales Office nearest you, or clip the coupon below. *General Electric Co., Schenectady, N. Y.*

Sec. E720-83, General Electric Co., Schenectady 5, N. Y.

Please send me a copy of Bulletin GEA-4945, "Induction Heating in Industry."

☐ for reference

☐ for immediate project

Name.....

Company.....

Street.....

City.....

State.....

GENERAL ELECTRIC

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Madison Mfg. Co., Muskegon Heights, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

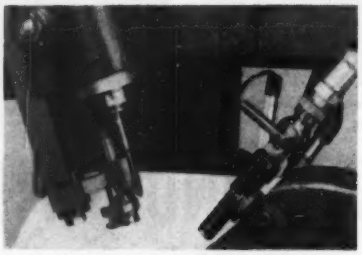
Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

At Last! A Way To Get Uniform Rake Angles On All Taps

The difficulty of regrinding a once-accurate tap to its original rake angle is often responsible for low production per tap and excessively high tap costs. Grinding other taps to the same uniform rake angle has also presented a problem.

A METHOD OF PRECISION SHARPENING

There is, however, one method of sharpening both old and new taps precisely to provide one uniform rake angle—the one which is desired. These excellent sharpening results can be obtained by regularly using the Blake Flute Grinder and the Blake Chamfer Grinder for all your taps. These are the only two machines on the market today that enable you to grind your taps to such true-cutting accuracy. With Blake equipment you can sharpen each tap precisely to provide not only for uniform rake angles on each cutting edge, but also for uniform spacing of cutting edges and accurate chamfers. The Blake method of precision sharpening results in much longer tap life, greatly reduced tap costs, and more accurate finished work.



THE HEART OF PRECISION SHARPENING!
Photograph shows close-up of tap positioning mechanism of the Blake Flute Grinder.

READ THE FACTS NOW!

For a detailed explanation of the benefits of precision tap sharpening, write us for the recent *Machinery* article, "Why Taps Should Be Sharpened Precisely". It may prove an eye-opener! Descriptive bulletins on both Blake machines are also available at your request.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 551)

BLAKE FLUTE GRINDER (Described in Bulletin 631)

= ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS .

Write for details about both machines!

EDWARD BLAKE COMPANY 442 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS
BLACK DIAMOND PRECISION DRILL GRINDERS . . .
WALTHAM CUTTER SHARPENERS . . . SURFACE FINISH STANDARDS

Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

RECORDING INSTRUMENTS for Electricity

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

RECORDING INSTRUMENTS for Pressure

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Speed

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Temperature

Bristol Co., Platts Mills, Waterbury, Conn.

REELS, Stock, Standard and Automatic

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

RIVETING MACHINES

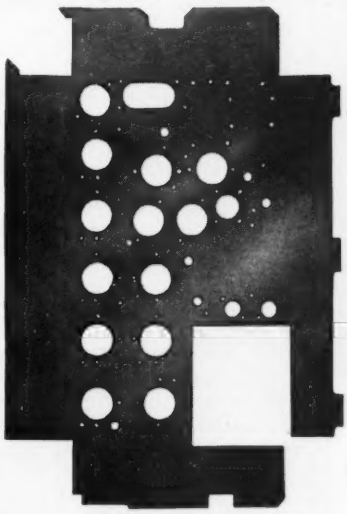
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

(Continued on page 366)

how would you produce these jobs?

IN THESE QUANTITIES

850 PIECES
SIZE: 11½" x 17" x .040" thick



TIME: 4.5 minutes per piece

25 PIECES
SIZE: 8" x 10"



TIME: 55 seconds each floor to floor including set-up

75 PIECES
SIZE: 47" x 20¼" x ¼" thick



TIME: 6.2 minutes each floor to floor including set-up

IN THESE TIMES *(including set-up)*

without *LAYOUT* *BURNING* *DRILLING* *MULTIPLE HANDLINGS* *STRAIGHTENING TIME* *FLY CUTTING*

and at absolute minimum tool cost

These jobs, times, and costs are typical—users of Wiedemann Turret Punch Presses are meeting these figures every day—day in and day out.

Why not write for a Wiedemann Analysis and Data Sheet for recommendation on your pierced work? No obligation.

NO JOB TOO LARGE . . . NO RUN TOO SMALL

WIEDEMANN MACHINE COMPANY

4205 WISSAHICKON AVE • PHILADELPHIA 32, PA.

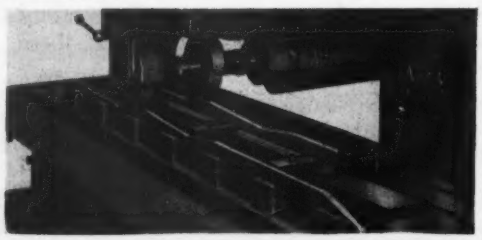


for • 4 POINT • production in non-ferrous milling

Here are metalworking's fastest milling machines for milling aluminum and related non-ferrous metals. With Onsrud Hi-Speed, Hi-Feed Milling Machines you obtain the four vital advantages of accuracy . . . fine finish . . . high production speed . . . and low cost tooling. Accuracy and fine finish result from massive bed and column construction and precision workmanship. High production speeds are possible with direct drive cutter motor speeds of up to 10,800 RPM. Floor to floor production time is at a minimum due to high spindle speeds and feeds. Cutter costs too are held to a minimum since high spindle speeds permit use of small diameter cutters.

another ONSRUD feature!

On Onsrud A-24 Horizontal Milling Machines, pivot mounting of motor and arbor permits "rise and fall" motion for contour milling under profile bar control. Tooling costs in this type of set-up are low . . . and milling speeds are extremely fast.



For complete information write for Onsrud Bulletin 1139 . . . Onsrud A-24 Milling Machines.

ONSRUD MACHINE WORKS, INC.

3940 PALMER STREET • CHICAGO 47, ILLINOIS

Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment.

SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Millers Falls Co., Greenfield, Mass.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Skilsaw, Inc., 5033 N. Elston St., Chicago, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

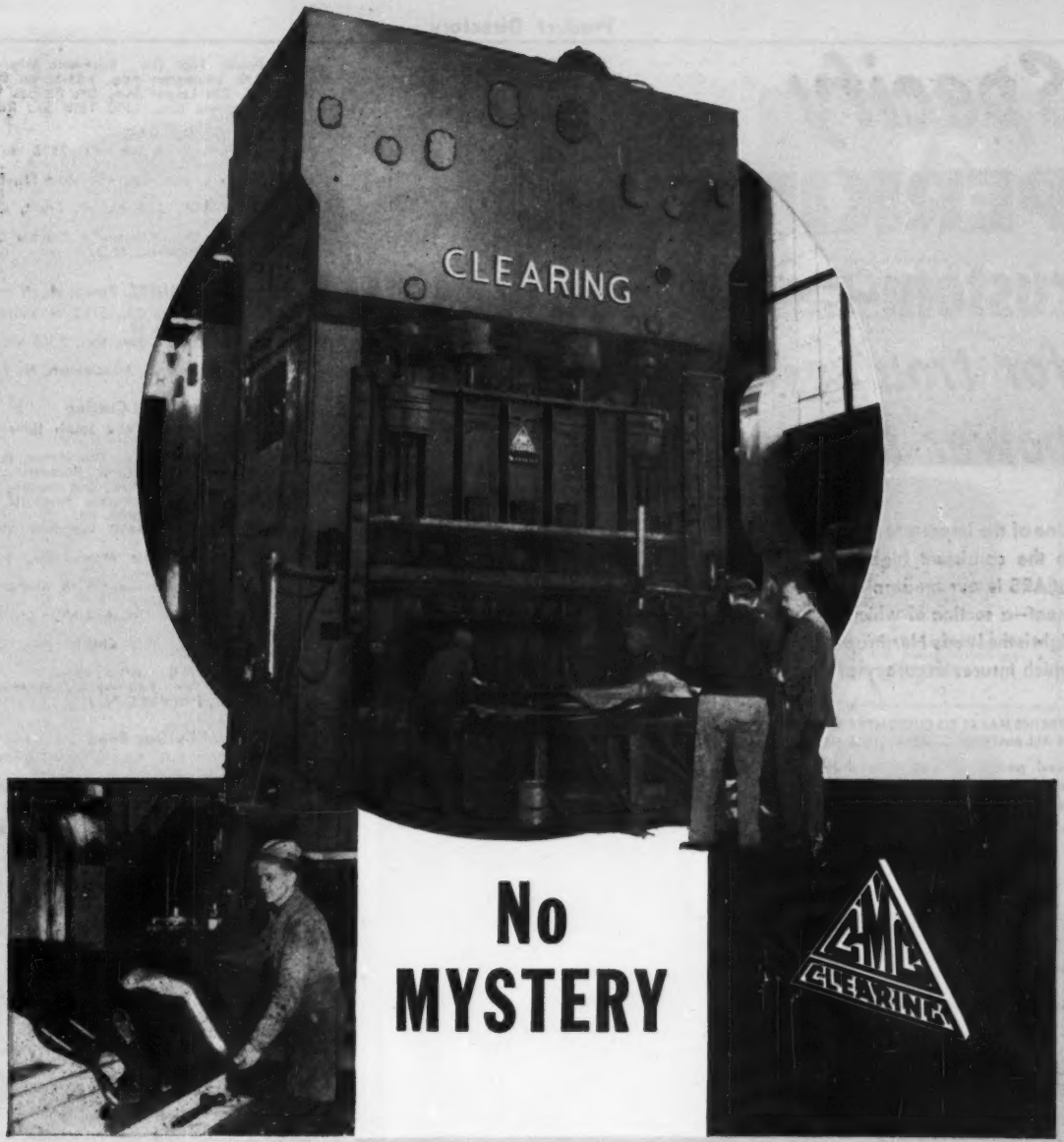
SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.

(Continued on page 368)



No MYSTERY

Clearing presses are much in evidence in the Kaiser-Frazer Shadywillow plant, opened some months ago in the Wheeling area. The one in the photo is part of a line of four Clearings forming a production group in the new plant.

Kaiser-Frazer knew exactly what they were doing when they chose these Clearing presses. You see, there are Clearing presses in the parent plant at Willow Run, and they've been on the job there for quite a while.

CLEARING MACHINE CORPORATION
6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS
HAMILTON DIVISION, HAMILTON, OHIO

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

Specify PERKINS custom-made GEARS for trouble-free power transmission

One of the important factors which contribute to the consistent high quality of PERKINS GEARS is our modern heat-treating department—a section of which is shown below. At right is the Leeds-Northrup control panel which insures accuracy of temper.



PERKINS MAKES TO CUSTOMERS SPECIFICATIONS IN ALL MATERIALS, METALLIC & NON-METALLIC:

bevel gears, ratchets, ground thread worms, spiral gears, worm gears, helical gears, spur gears with shaved or ground teeth.

you furnish the specifications we'll produce the gears!



a New product
the PERKINS PRECISION SPRING COILER

This patented spring coiler turns out precision springs of any type, shape or size from wire sizes .005 to .125. Complete data and prices upon request.

Perkins Machine & Gear company
west springfield massachusetts

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 1300 18th St., Racine, Wis.
Grob Bros., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 N. W. Front, Grand Rapids, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.
Skilsaw, Inc., 5033 N. Elston St., Chicago, Ill.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power

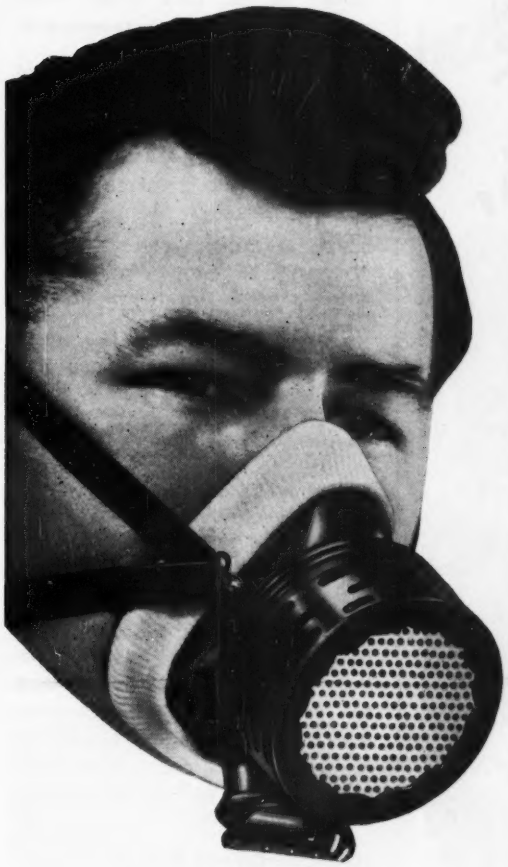
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
(Continued on page 370)



RESPIRATORY PROTECTION



*WITH **R31** CARTRIDGE — For low concentration of light organic vapors and gases in paint spraying, degreasing, dry cleaning, cementing, etc. Absorbs vapors of benzene, xylene, toluene, gasoline, naphtha, acetone, turpentine, etc.



*WITH **R32** CARTRIDGE — For low concentrations of acid gases, mists — sulphuric acid, hydrogen chloride, etc. Used in plating, pickling operations and similar.



*WITH **R13** CARTRIDGE — For nuisance and pneumoconiosis-producing dusts. (BM-2121)



*WITH **R33** CARTRIDGE — For low concentrations of combined acid and organic gases such as halogenated hydrocarbons, carbon tetrachloride, acetic acid. Protects in degreasing operations, etc.



*WITH **R16** CARTRIDGE — For toxic dusts not significantly more harmful than lead. (BM-2138)



*WITH **R34** CARTRIDGE—Protects against nuisance concentrations of ammonia.



*WITH **R17** CARTRIDGE—For all dusts not significantly more toxic than lead. (BM-2138)

1 FACE PIECE— 7 CARTRIDGES

(Quickly Interchangeable)

Protect against Dusts, Gases and Vapors

WITH THE AO R2000 RESPIRATOR

When a variety of hazardous vapors, gases or dusts are a problem, you can now simplify the protection and save money by standardizing on the AO R2000 Respirator. Its single, basic face piece accommodates four chemical cartridges of NON-SPARKING metal and three dust cartridges which, while light in weight for comfort, have maximum filtering capacity. CARTRIDGES INTERCHANGE WITH A TWIST OF THE WRIST—one twist removes outer cover, a second replaces it. Respirator may also be used with highly efficient, chemically-treated disposable dust filter.

QUICK RESPIRATOR FACTS

- Face mask molded from pliable rubber.
- ½" rubber headband.
- Inhalation valve of pure gum rubber freely admits air at lightest intake of breath, seals tightly on exhalation.
- Exhalation valve cannot stick, completely expels air—moisture cannot collect, dust cannot enter.
- Disassembly for cleaning is easy without special tools.

Your nearest AO Safety Products Representative can supply you

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Eastern Mch. Screw Corp., New Haven, Conn.
Maryland Precision Instrument Co., 12 E. Lanvale St., Baltimore 2, Md.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES

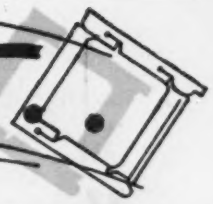
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

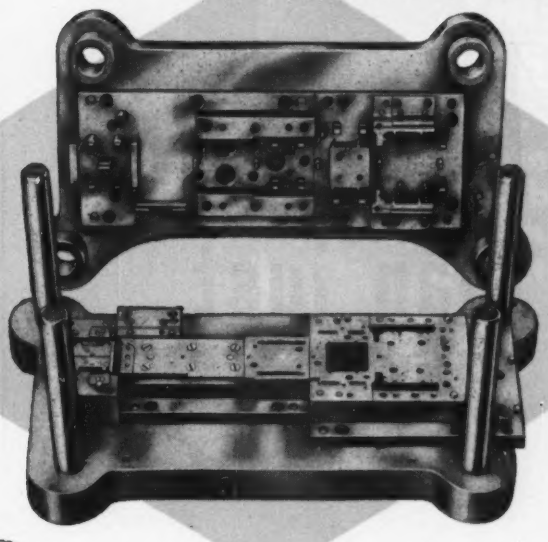
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bristol Co., Platts Mills, Waterbury, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

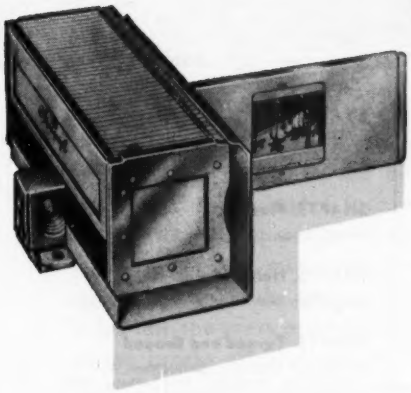
(Continued on page 372)

200 frames a minute...



on PRODUCTO DIE SET





PERFORMANCE

12,000 pieces produced per hour
Over 2 million pieces produced between grinds
Continuous operation for 20 months

EQUIPMENT

Die: six-station (piercing, forming, cut-off)
Die Set: Producto special four-pin
Feed: special high-speed automatic

SPECIFICATIONS

Frame Size: 2.157 inches by 2.020 inches
Tolerances: plus .000 inch minus .005 inch
Material: .010 inch thick 52 S-H38 aluminum

Need Prompt Service? Call Your Nearest Producto Branch:

Bridgeport 1 — 970 Housatonic Avenue
New York 12 — 197 Lafayette Street
Providence 3 — Durant Tool Supply Co.
Camden 2 — Fidelity Tool Supply
Detroit 11 — 3017 Medbury Avenue
Cleveland 14 — 3200 Lakeside Avenue
Dayton 7 — 3632 Delphos Avenue
Chicago 44 — Federal Machinery Sales Co.
Los Angeles 21 — Jamison Steel Corp.
San Francisco 7 — Jamison Steel Corp.

It is no secret that the ease of operation of the slide changer, illustrated above, is due to the precise stamping of the frames. To obtain consistently accurate frames, the Airequipt Mfg. Co., New Rochelle, N. Y., selected a Producto die set to mount their die. Result — practically no rejects, and an amazing production rate of 200 frames per minute!

Call your nearest Producto branch . . . they have the answer to greater stamping accuracy and higher production.

THE PRODUCTO MACHINE COMPANY
985 Housatonic Ave., Bridgeport 1, Conn.

FOR PRECISION DIE SETS . . . FAST . . . CALL . . . PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

4PDSE

You get *MORE* than just steel

Personalized service is the big "plus" you get when you come to us for your warehouse steel requirements.

Warehouse steel is a bargain for you when you take full advantage of the "no extra charge" service United States Steel Supply's team of technical and service experts will give you.

Full information on available steel supplies . . . current prices . . . latest in production techniques . . . machinery and shop supplies . . . will be brought to you *personally* by the United States Steel Supply salesman, who regards your needs as his personal responsibility.

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UNITED STATES STEEL COMPANY

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ROCKFORD, ILL. · SALT LAKE CITY · SOUTH BEND · TOLEDO · TULSA · YOUNGSTOWN

UNITED STATES STEEL

SCREWS, Self-Tapping Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease

Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave, Chicago, Ill.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co., Box 770, Saginaw, Mich.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.

SHAFTS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS

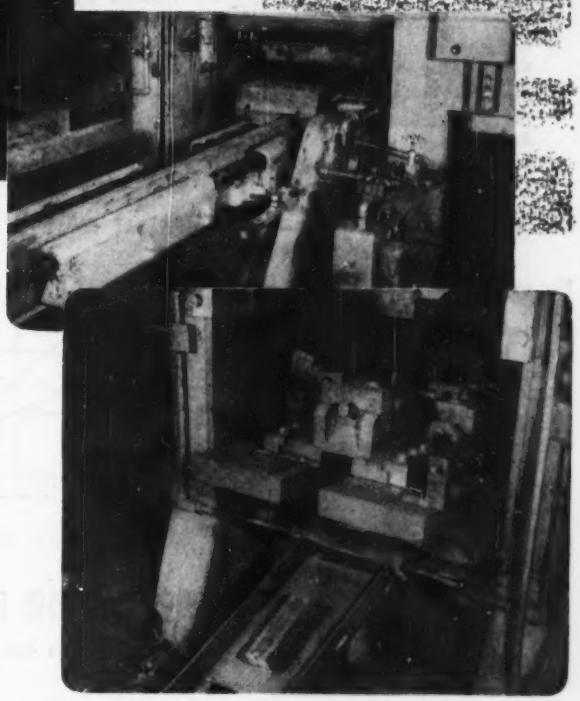
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hall Tool Co., 3240 Market St., Philadelphia 4, Pa.
Hendey Machine Co., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

(Continued on page 374)

another tough job done better with Verson equipment



THIS Verson TOOL-UP breaks round corner square billets for 90, 105 and 120 mm. projectiles



In this Verson engineered tool-up a 500 ton Verson press and a Verson billet breaking die breaks 3, 3½ and 4 inch round corner square billets preparatory to the forging of 90, 105 and 120 mm. projectiles. The tool-up is automatic—the proper length of stock is fed into the press pneumatically; each press stroke breaks a billet and the broken piece drops into a conveyor to be moved to the next stage in a fully automatic Verson shell line.

Here is another example of how know-how combined with imagination can boost production and cut costs on vital defense work. You can put this experience to work on your stamping and forging problems, too. Write or phone.

Close-ups of the Verson billet breaking die. The upper view is from the rear of the press, the lower view from the front.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9309 South Kenwood Avenue, Chicago 19, Illinois — So. Lamar at Ledbetter Dr., Dallas, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

YOU *Can* AVOID DIE COSTS COMPLETELY

On Your Next
STAMPING ORDER





Yes, you can – but it's not *necessarily* the best thing for you.

You want the lowest unit cost – *for the life of the part*, including re-runs. It may well be that our **Machine-Cut Method**, with no die cost, does work out best.

Or, it might better be our **Short Run Method**, using economical blanking dies and stock punches.

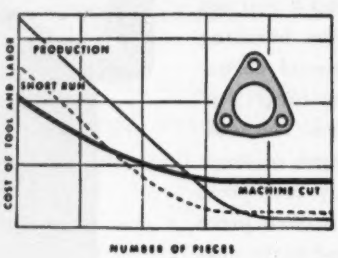
Sometimes, even with very short runs, it pays to use our **Production Method** with a standard die or our own surprisingly inexpensive Hecht-type tool.

In *any* case, the decision is a technical one based on many factors, not just length of run. You save money when the correct decision is made.

WE USE ALL THREE METHODS — LET US MAKE AN IMPARTIAL DECISION FOR YOU

For example, take the part illustrated. From 1-65 parts, our Machine-Cut Method is most economical. At 65 parts, the Short-Run Method is best until, at 7,000 units, the standard Production Method is most satisfactory.

These breaking points as charted vary drastically with every stamping, but the general principle remains the same.



LAMINATED SHIM COMPANY, INC.

Manufacturers of ALL TYPES OF SHIMS

STAMPINGS DIVISION

"ONE PIECE OR ONE MILLION"

STAMPINGS DIVISION, LAMINATED SHIM COMPANY
3909 Union Street, Glenbrook, Conn.

Gentlemen:

Please rush me my free copy of "SERVICE IN STAMPINGS"—the 12-page, illustrated booklet full of helpful facts on the economical buying of stampings.

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

SHAPERS, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neill-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 1300 18th St., Racine, Wis.
Kling Bros. Engineering Works, 1320 No. Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

(Continued on page 376)

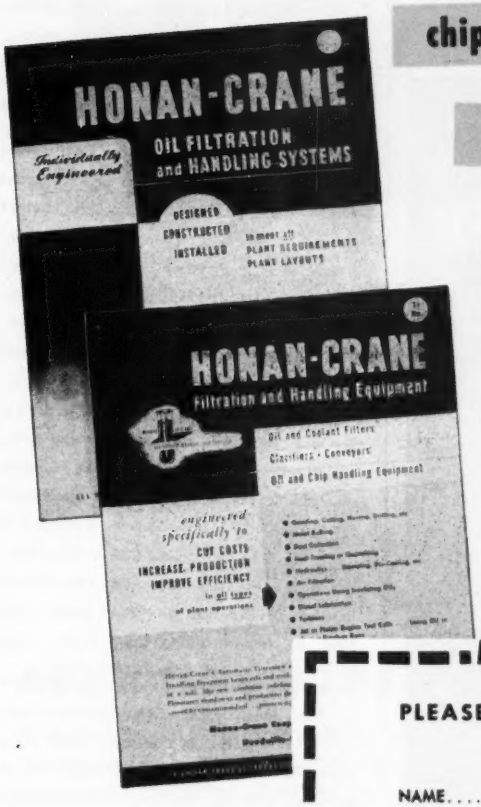
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Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
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Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
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Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
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Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
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Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 378)

When it comes to production-come to Hartford Special

NEW Larger Size – Greater Capacity

AUTOMATIC THREAD ROLLER

MODEL A-312-H

The Hartford Special Model A-190 Automatic Thread Roller has now been on the market for more than three years. During this time it has met with universal satisfaction from its many users, and this favorable reception and experience by the trade has naturally influenced us to design and develop a larger capacity machine.

NOW HARTFORD SPECIAL ANNOUNCES the new Model A-312 Thread Roller which takes machine screws up to 5/16" diameter by 2" long at a production rate up to 140 pieces per minute dependent upon screw size.

If you roll threads, write for Bulletin TR-312-100



Hartford Special also makes these production machines



SUPER-SPACERS AUTOMATIC DRILLING & TAPPING MACHINES

HARTFORD Special

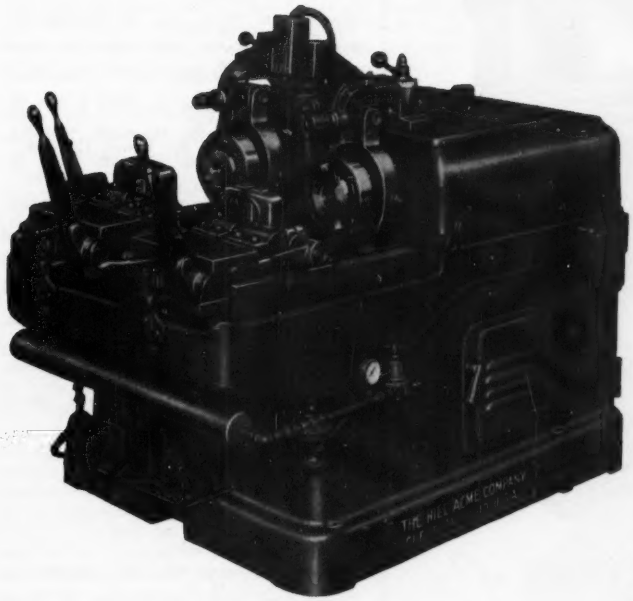
THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT

Another FIRST

FOR

ACME XL

THREADING MACHINES



Air operated Head now available . . .

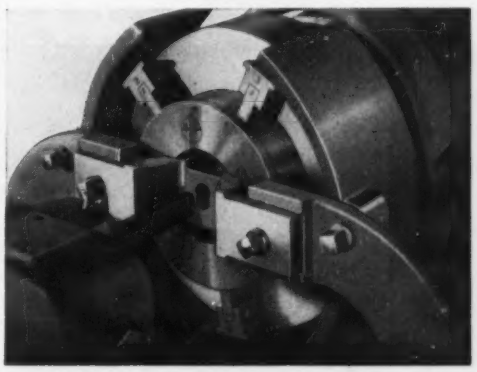
Acme Model XL Threading Machines can be equipped with a semi-automatic, air-operated head-opening and closing mechanism for rapid lock and release of dies to provide greater accuracy of thread length and reduce operator fatigue. A bleeder valve adjustment provides variable speed to this head tripping mechanism. Forward and return movement of the carriage effects the opening and closing of the die head.

This new device is an exclusive feature of ACME Model XL Threading Machines and is adaptable to both single and double spindle machines in the complete range of sizes offered.

HILL ACME TOOLS FOR INDUSTRY

ACME HOB TYPE 5 DIE HEAD

The problem of threading rectangular stock with an interrupted cut, is solved by the ACME HOB TYPE 5 die head. This special head insures three chasers always being in contact with the work. With the five die head illustrated, a guide is provided to compensate for the torque developed when threading rectangular stock. This adaptation of ACME Threading Equipment to difficult jobs, illustrates why the large percentage of pipe wrench manufacturers are using ACME Threading Machines today, replacing the obsolete thread milling method.



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ACME MACHINERY DIVISION • **1203 W. 65th St., Cleveland 2, Ohio**

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Time and motion study experts agree that production rises when worker-fatigue is lessened. Reid Grinders are designed for the operator's efficiency, as well as for precision work. No time is lost reaching beyond normal standing position to operate controls of the Reid Grinder. Finger-tip level control wheels and switches accelerate work, prevent fatigue, and increase the safety factor. The Reid grinder is always under the operator's complete control, reacting instantly to his guidance. Naturally, such a grinder performs at peak efficiency in an operator's skilled hands, and the output is at a constant high level, as to volume and quality.

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Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.
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Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
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Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

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Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

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Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
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Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.

(Continued on page 380)

Only MARVEL *builds all four**

***HACK SAWING MACHINES**

***BAND SAWING MACHINES**

***BAND SAW BLADES**

***HACK SAW BLADES**

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds **BOTH** hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and **unbiased** recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements — the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing **machines** and metal sawing **blades.** Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

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Exclusive *open throat design* of the **BATH TANGENT BENDER** assures continuous high speed production of metal cabinets, cases and housings. **Flanged** sheets can be shaped to produce cabinets having two or more radius corners. Crown, corners and sides are formed in **single cycle of operations.**

BATH TANGENT BENDER features automatic positioning of metal to be formed and close control throughout the entire process. *Result is volume production of uniform shapes without work wrinkles or deformation.*

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469 CY

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Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. La Salle St., Chicago 4, Ill.
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Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

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Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

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Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Holliday, W. J., & Co., Hammond, Ind.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

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Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
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Timken Roller Bearing Co., Canton, Ohio.
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Wheelock, Lovejoy & Co., Inc., Cambridge. Mass.

STEEL, Strip and Sheet

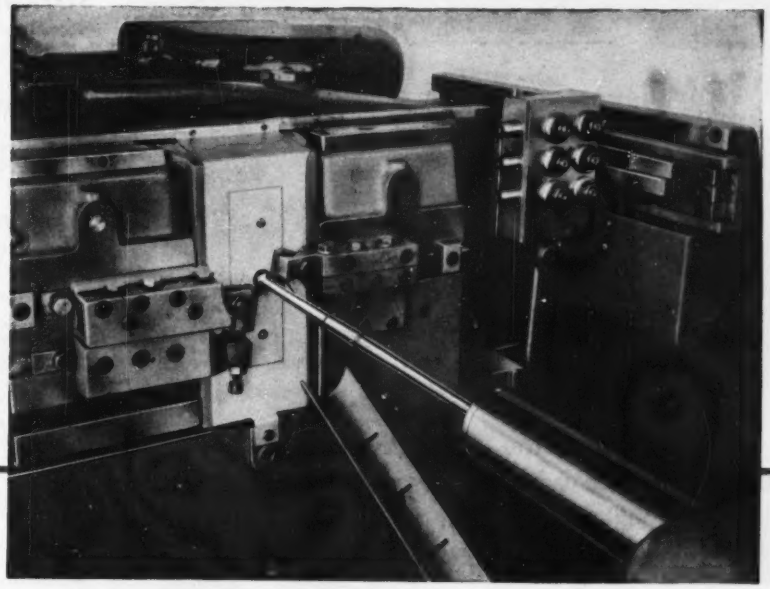
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
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Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

(Continued on page 382)

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View shows set-up to produce this 21 5/8"-long piece.

Headstock feed permits all turning operations to be performed at point of support.

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STEEL BARS—See Bars, Steel.

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Look to Kempsmith for milling machines, attachments, arbors and accessories. They are backed by more than 60 years specialized experience in this field.

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Colonial Broach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
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SURFACE PLATES

See Plates, Surface.

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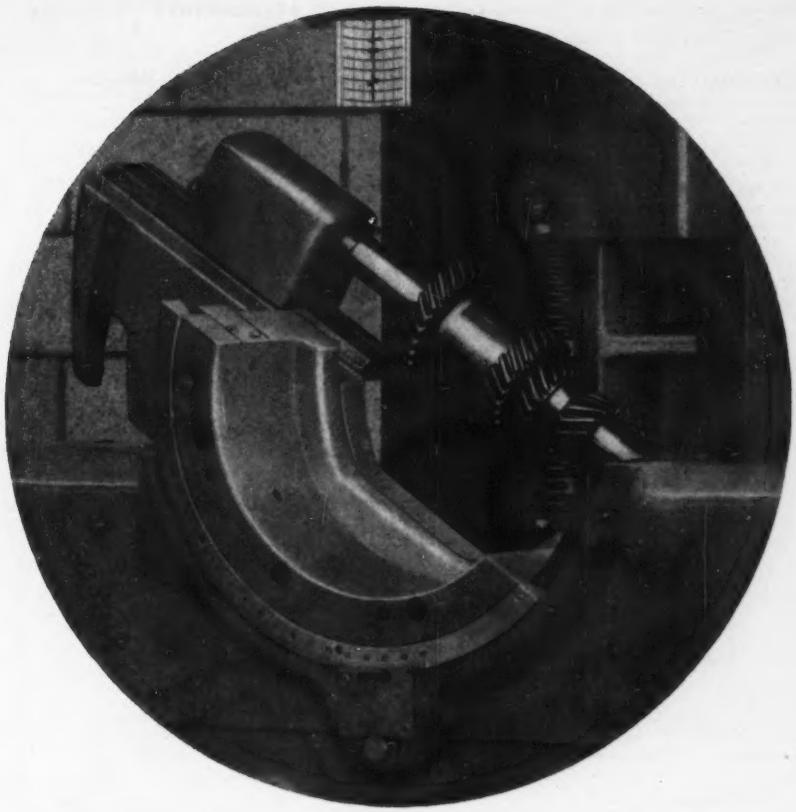
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.

(Continued on page 384)

here's a practical way to check spur and helical gears





The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variation, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 4U, for gears up to 4⅛" pitch diameter. Larger and smaller models are also available.

In the final analysis, the accuracy of a gear is judged by whether or not it is good enough for the job.

Individual checks on errors such as profile error and pitch error can show tolerable variations which could combine to give a result intolerable in performance. Conversely, two intolerable errors might cancel out. But the composite check recommended in the American Standard (AGMA 236.02; ASA B6.11-1951) tests gears in action—tells at once whether or not the gear will do the job required.

With a Kodak Conju-Gage Gear Checker, you can check composite error to the closest tolerances. The reason lies in the Kodak Conju-Gage Worm Section. A single Worm Section, replacing a collection of master gears, can be used to check any spur or helical gear of any helix angle providing it has the same normal pitch and pressure angle. Its inherently simple and accurate form permits grinding to tolerances almost impossible to obtain in circular masters, especially in finer pitches.

Quick, conclusive, and accurate, the Kodak Conju-Gage Gear Checker makes it easy to meet specifications limiting tooth-to-tooth composite error to as little as .0002". It automatically writes records to hold or ship with finished gears. And the gaging element can be checked in your own toolroom—economically reground to original specifications if necessary.

To find out how the Kodak Conju-Gage Gear Checker can solve your precision inspection problems, send for the booklet, "Kodak Conju-Gage Gear Testing Principle." It's yours for the asking by writing to Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

CONJU-GAGE INSTRUMENTATION

. . . a new way to check gear precision in action

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

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Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

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Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Mch. Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Bath, John, Co., Inc., Worcester, Mass.
Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., Detroit, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hy-Pro Tool Co., 100 Mt. Pleasant Ave., New Bedford, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

TELESCOPES, Alignment

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

THERMOMETERS, Indicating and Recording

Bristol Co., Platts Mills, Waterbury, Conn.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Tapping Mch. Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.

(Continued on page 386)

NEW PROCUNIER TAPPERS

Work FASTER

Last LONGER

...and save Taps too!



Procunier Tapping Equipment is the answer to today's pressing need for tapping equipment that will meet current high-speed production demands and at the same time reduce maintenance and operating costs.

Developed by practical craftsmen—who have concentrated exclusively on deve'oping, improving and perfecting tappers for more than 30 years—Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads **faster, for longer periods**—with fewer spoiled pieces, fewer rejects. Here's why:

1. **Tap breakage is practically eliminated** due to the high sensitivity of the new Procunier cork-faced friction clutch which automatically regulates driving pressure. Thus, even "green" operators can quickly detect dull or loaded taps by the "feel" or pressure on the clutch.
2. **Strain and wear are minimized** and torsion eliminated thru special gear reversing mechanism which distributes pull thru three intermediate gears.
3. Chuck spindle is supported at both ends assuring true operation—**avoiding tap wobble.**
4. **Aluminum housings** assure greater strength and rigidity with minimum weight—a vital factor for high speed tapping.
5. PLUS many other exclusive features.

with the NEW "TRU-GRIP" Tap Holder

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

WRITE TODAY for more complete details and specifications on the complete line of Procunier Tapping Heads and see why Procunier offers the "finest in tapping equipment."

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SAFETY CHUCK CO.
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PROCUNIER SAFETY CHUCK CO.
16 S. Clinton Street
Chicago 6, Ill. Dept. 9

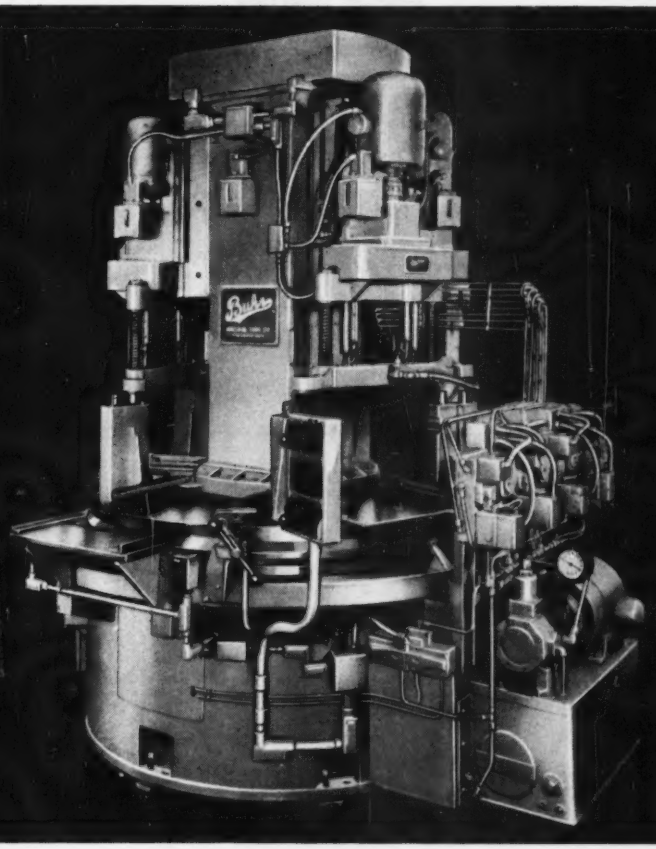
Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

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Address.....

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THANKED FROM TOKIO TO TEMPLEHOF!



Aircraft Pilots . . . from Tokio Airport in Japan to Templehof Airdrome in Berlin . . . are grateful for such Production Stalwarts as this Buhr 5-Station Hydraulic-Feed Center-Column Special Machine . . . which is now working the clock around . . . helping to turn out Cylinder Heads for one of the world's largest manufacturers of aircraft engines—engines on whose reliability pilots consistently stake their lives! Is it any wonder that some of these pilots . . . who know the fundamentals of production . . . say "thanks" to such Special Machinery as this . . . for a job well done?

Aviation Industries Rely on Machinery Like This for Critical Production Work

For making such a critical product as a large aircraft engine, Uncle Sam chose one of the world's best-known engine manufacturers. Volume Production . . . of the highest quality . . . had to be set up as quickly as possible.

One of Their Problems



To drill and ream the holes in the Cylinder Heads of this particular aircraft engine—that was one of their problems.

To handle this important phase of their production, they called in Buhr.

What the Machine Does

In general—this Five-Station Hydraulic-Feed Center-Column Machine with 72″ Automatic Index Table . . . drills and reams (6) holes in Rocker Arm Pockets in Cylinder Head of Aircraft Engine . . . handling four parts at a time.

Specifically, the Machine accomplishes this—

Station 1—Load and unload
Station 2—Drills (2) 1″ dia. holes
Station 3—Drills (2) $^{23}/_{32}$″ dia. holes
Station 4—Drills (2) more 1″ dia. holes
Station 5—Reams (2) .750″ dia. holes

PRODUCTION—50 parts per hour at 100% efficiency.

Why Buhr Was Chosen

In the Aviation Industry . . . as in many others . . . Buhr has served leading manufacturers for many years—some for more than a quarter-century! They have come to rely on Buhr whenever they need machinery for critical high-volume production. They know that Buhr has excellent manufacturing facilities . . . that their sales, engineering and production staffs are trustworthy and experienced, specialized in this kind of machinery, and available anywhere in the United States.

For Details About Buhr



A comprehensive Catalog . . . or a personal call from a Buhr Sales Engineer . . . is yours for the asking. For every problem involving this type of Special Machinery—including the type that's "thanked from Tokio to Templehof"—phone, wire or write us.

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Ann Arbor, Michigan
Phone: Ann Arbor 2-5646—5980
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Buhr ***SPECIAL MACHINERY . . . Leaders Make Sure With BUHR***

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Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co, Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLS BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

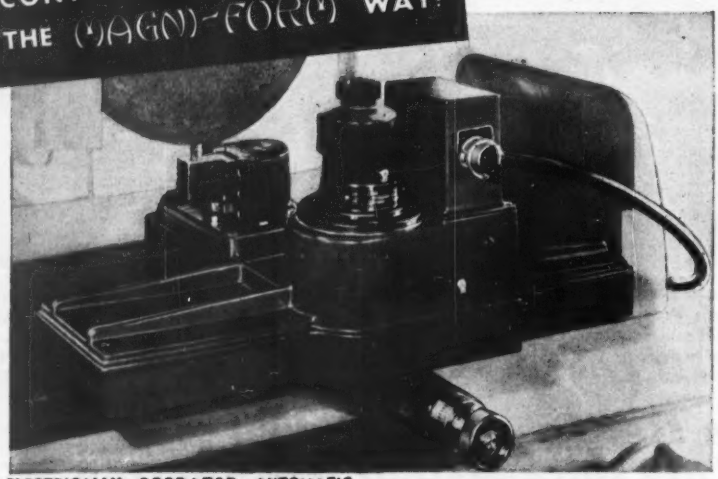
See Grinding Machines for Sharpening, Turning and Planing Tools.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Blake, Ed., Co., 442 Cherry St., West Newton 65, Mass.
Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Lovejoy Tool Co., Inc., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

(Continued on page 388)

GET ACCURATE, LOW COST CONTOUR WHEEL DRESSING THE MAGNI-FORM WAY!



ELECTRICALLY OPERATED AUTOMATIC CONTOUR WHEEL DRESSER, MODEL KB- 4-2

The MAGNI-FORM Universal Contour Wheel Dresser is designed to fit any type horizontal surface grinder. It can be mounted on the magnetic chuck or directly on the machine table. Check these advantages and compare!

1. **"Tenths" accuracy at once.**
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3. **Lighter, more compact, better balanced. No interfering overhang.**
4. **Dresses any complex contour that can be entered by the diamond — across the full width of the wheel.**

Uses a 10:1 ratio template to control movement of the diamond. Simple ratio arm and slide is without complicated linkages. The MAGNI-FORM Universal Dresser is easy to set up, simple to operate. Write for complete details in Bulletin M.

Made In 3 Types

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Special Dressers for Aircraft Gear Grinding — producing a perfect blend between involute form and root fillet — AUTOMATICALLY.

MAGNI-FORM CONTOUR WHEEL DRESSER

HOGLUND ENGINEERING AND MANUFACTURING CO. INC. BERKELEY HEIGHTS, N. J.



engineered by LAPOINTE

embody all the accumulated experience of our 50 years as **pioneers** in the art of broaching. This valuable "know-how" is put at your disposal every time you send us an order or an inquiry.

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Recent plant expansion has still further increased our capacity to produce broaches . . . although we are already the largest producer of broaches in the industry!

It is definitely to your advantage, when you need broaches, to look to the leader . . . look to **LAPOINTE!**

Send for our brochure on broaches. Ask for Bulletin B-1

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Starrett, The L. S., Co., Athol, Mass

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Colonial Broach Co., Detroit 13, Mich.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Reliance Elec. & Engrg. Co., Collinwood Station, 1088 Ivanhoe Rd., Cleveland, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Yoder Co., 5500 Walworth Ave., Cleveland, Ohio.

TUBE TESTING AND EXPANDING MACHINES

Hydropress, Inc., 350 Fifth Ave., New York 1 N. Y.

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Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Frasse, Peter A., & Co., Inc. (Seamless), 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Philadelphia Gear Works (Motorized), Erie Ave., and G St., Philadelphia, Pa.

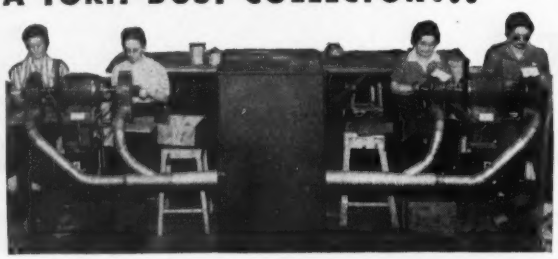
VALVES, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

(Continued on page 390)

Over 25,000 TORIT DUST COLLECTORS Now IN OPERATION

A TORIT DUST COLLECTOR . . .



at Four to One Still Your Best Bet!

TORIT FB TYPE Dust Separator



Torit also manufactures a line of cyclone type dust separators. Sizes up to 5 H.P., with or without after-filters.

Here four grinding wheels are in constant use finishing small parts, yet this 1½ H.P. Model 81 Torit Dust Collector completely eliminates any abrasive dust hazard to operators or to finished parts.

The efficient, self-contained design of Torit Dust Collectors permits compact set ups like this. There is no work interference, piping is minimized, and operating costs are low because this Torit Dust Collector runs only when the wheels are in operation.

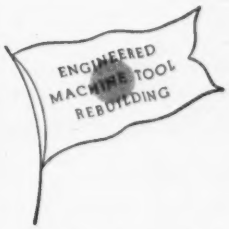
Solve your dust problems with Torit Dust Collectors. Models and sizes for standard and special dust-collecting problems. Ask for details and the latest Torit catalog.

TORIT

MANUFACTURING CO.
307 Walnut St St. Paul 2, Minn.

"Life Extension Institute" for Your Machine Tools





Speed was the problem here. As part of the Government machine tool re-activation program, Simmons has rebuilt over 400 machines. Shown in this bay (fore) are automatic screw machines, deep-hole drillers and various special tools. Despite this program, Simmons was able to continue its rebuilding for industry—thanks to its 120,000 square feet of plant capacity and diversified equipment.



Alignment of head and tail stock is part of the final test of this Landis grinder.



Sand blast facilities are maintained at Simmons to clean cast parts, remove inclusions.

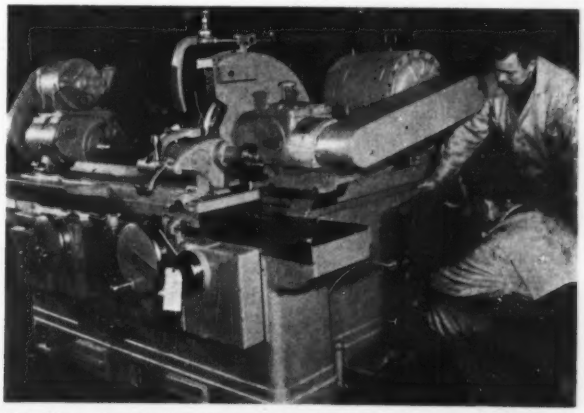


Modernizing: To adapt these deep-hole drillers for carbide tooling, speed was doubled from 1500 to 3000 rpm; cooling system pressure was increased; heavier electrical equipment installed.

Rebuilding is the fastest way to get machine tools *today*. You will find that there are no long waits for delivery. *Engineered Rebuilding* guarantees user satisfaction. If you'd like to learn more about it, write for our quarterly, THE SIMMONS WAY.

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1600 North Broadway, Albany 1, N. Y.

SIMMONS GIVES USED MACHINE TOOLS A NEW LEASE ON LIFE



Checking electrical systems is an important part of Simmons *Engineered Rebuilding*. Here, two technicians check a control panel on a rebuilt Cincinnati grinder prior to inspection.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fenn Mfg. Co., Hartford, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Mch. Co., Torrington, Conn.
Martin, J. E., Mch. Works, 548 W. State St., Springfield, Ohio
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Martin, J. E., Mch. Works, 548 W. State St., Springfield, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.
Standard Locknut & Lockwasher, Inc., 510 N. Capitol Ave., Indianapolis, Ind.

WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

WELDING POSITIONER

Johnson Machine Works, 617 Menomonie St., Eau Claire, Wis.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich.
Woods, A. C., & Co., Div., Kropp Forge Co, 1129 Harrison Ave, Rockford, Ill.

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co, Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and C St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Sockets

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

WRENCHES, Ratchet

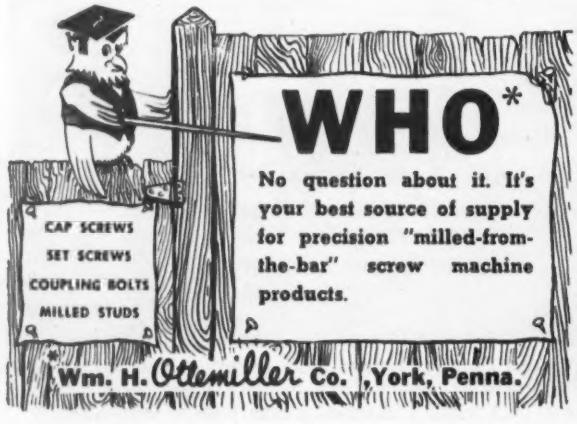
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Tap

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Sturtevant, P. A., Co., Addison, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

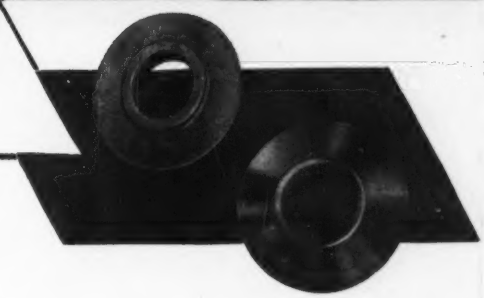






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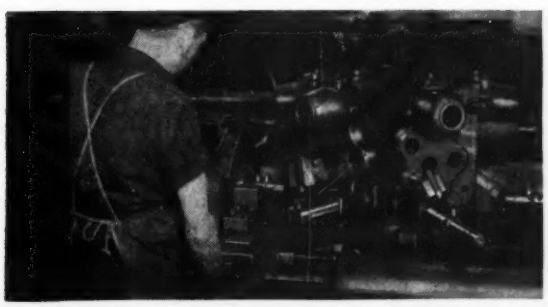


It may seem incredible, in this day and age, for any major machine tool to "buy" itself in nine short weeks of operation. But that's exactly what the Fastermatic Automatic Turret Lathe did on this job of machining clutch plate hubs.

Former time, on hand-operated turret lathes, was 15 minutes per piece. The Fastermatic, with automatic control of all machine functions, reduced the time to only 3 minutes, floor to floor.

Earnings piled up so fast over former production costs that the Fastermatic paid for itself in just 9 weeks—or 893 hours of operation.

Do you have work that permits a number of cuts in one chucking? Investigate the Fastermatics. You may have a big opportunity to increase production, cut costs and save man power.



In this tooling setup, only 3 turret faces are needed to turn each part. With duplicate tooling on the remaining 3 faces of the hexagon turret, 2 parts are machined with each complete turret cycle. The operator merely loads and unloads the work.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*



GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



STANDARD CARBOLOY TOOL PRODUCTION TIPS

1. A large radio manufacturer solved several of its trickiest, toughest automatic screw-machine problems by ignoring accepted practices and switching from steel tools to cemented carbide tools. First, a modified Standard Carboloy Tool (Grade 883 carbide tip) is used to turn B-1113 steel. Finish and accuracy are exceptional — *and tool life is extended to 50 to 60 hours of continuous production.*

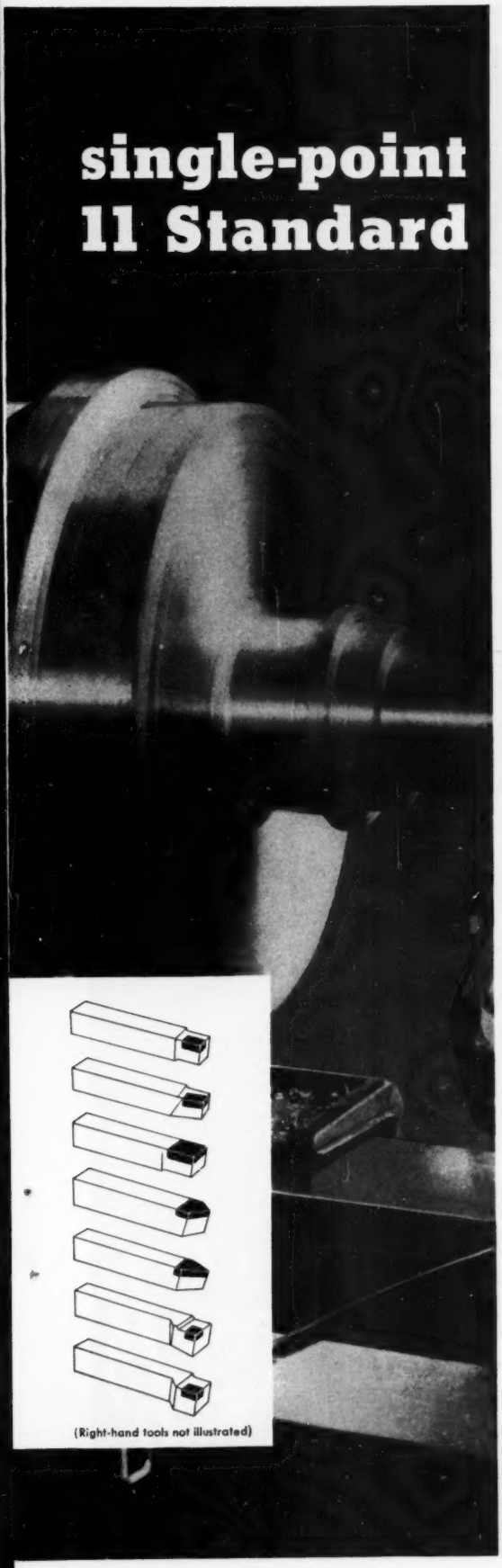
Second, high-speed steel tools failed completely on the cut-off job when positions were decreased from 3 to 2, and feed was increased from .0024" to .0037". Again breaking with tradition, this manufacturer cuts the B-1113 steel to dead center with Standard Carboloy Tools using Grade 883 tips.

2. A large motor-car company now performs nine roughing operations simultaneously on a 13½" O.D. cast aluminum converter pump with a special tool head incorporating modified Standard Carboloy Tools. The operation consists of 9 cuts — 3 facing, one boring, 3 combined boring and facing cuts, and 2 combination facing and chamfering cuts.

Total feed is .012" per revolution. Cutting speeds range as high as 3400 SFPM, spindle speed 800 rpm. *Output per machine per hour is tripled.*

If these cemented carbide applications suggest Standard Carboloy Tool uses you would like to explore further, please get in touch with your Carboloy representative.

single-point machining with 11 Standard Carboloy Tools



(Right-hand tools not illustrated)

11 Standard Carboloy Tools will do up to 80% of all your single-point turning, facing and boring . . . eliminate hundreds of costly, inventory-loading special tools.

What's more, fast-cutting Standard Carboloy Tools boost production as they chop tool and maintenance costs. *This has been proven in all types of shops on an industry-wide basis.* Tipped with the quality brand of cemented carbides, Standard Carboloy Tools easily outproduce and outlast steel tools by as much as 10 to 1 or more.

Cut faster, better, for less

Why not test Standard Carboloy Tools on your toughest job? Prove for yourself that whether used "as is" or quickly and economically ground to special shapes in your own toolroom, Standard Carboloy Tools will do your single-point machining jobs faster, better, for less.

And don't overlook the plus-values in Standard Carboloy Blanks. They're available in many styles; mass-produced at low cost in hundreds of sizes. They're easily brazed to tool shanks to handle those emergency jobs, without time or money wasted waiting for specials.

Extra carbide benefits

Carboloy-Developed Services lead to more efficient selection, design, use and maintenance of cemented carbide tools, result in *extra* carbide benefits. Services include Customer Training School, technical manuals, charts, catalogs, low-cost slide films . . . and on-the-job assistance of skilled Carboloy engineers to crack specific carbide problems.

Write for complete Carboloy General Tool Catalog, GT-250, or contact your local Carboloy Sales Engineer or Authorized Distributor today.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

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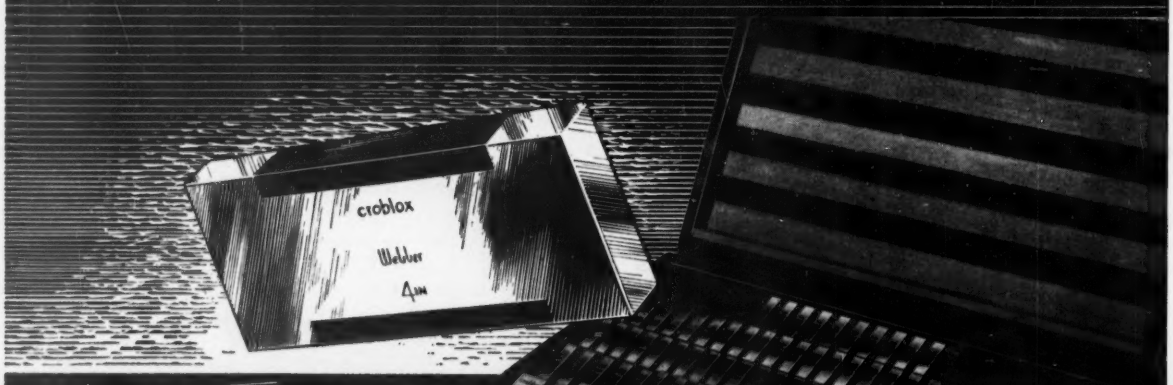
NOTE:

Magnet ideas to speed up general shopwork

See how Carboloy Permanent Magnet Sheet-Steel Separators prevent feeding of doubles. How permanent magnets give an extra "hand" in general shop work, including . . . magnetic stands, tool-holding devices, sweepers' pick-up tools, magnetic paper grippers on machines, containers for small parts and magnetic retrievers. (Write for Carboloy Magnet Ideas Kit, PM-102.)

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The new material is a carbide of chromium and is identified to the trade as CROBLOX.

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INTERNATIONAL

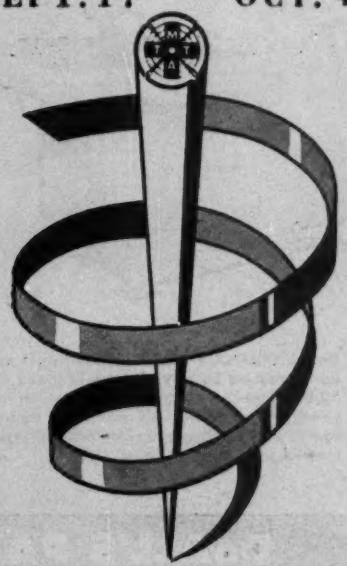
MACHINE TOOL

EXHIBITION 1952

OLYMPIA

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SEPT. 17 OCT. 4



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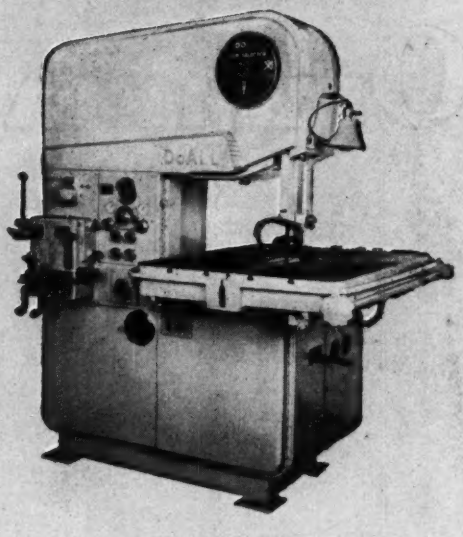
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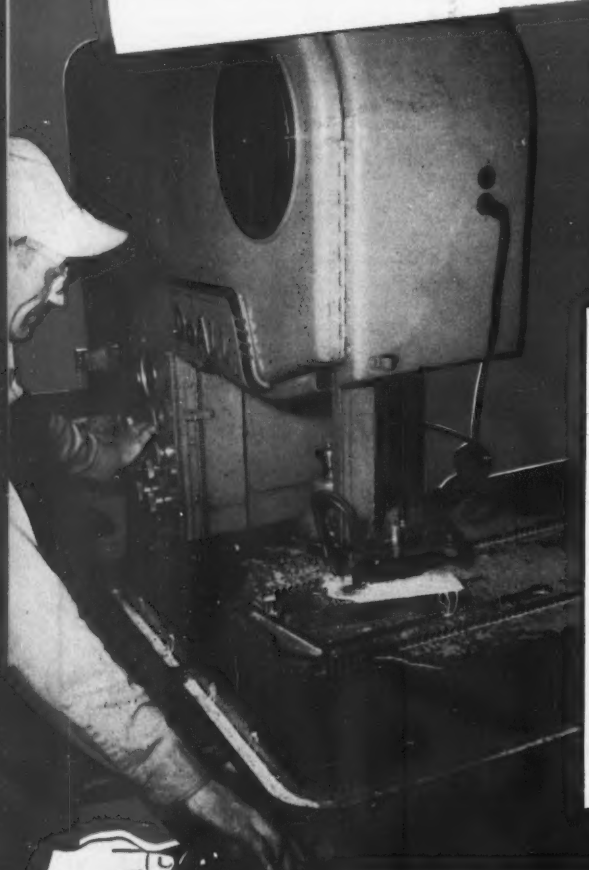
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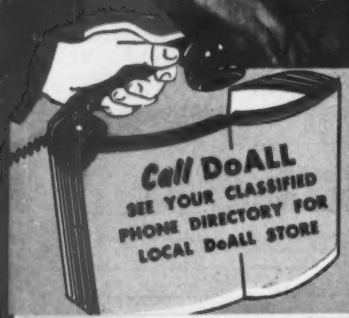
—precision, buttress, claw tooth, spring temper and friction saw bands; line grind, diamond and file bands; scallop edge, spiral edge and knife edge bands; abrasive bands. Ask for catalog.

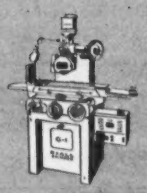
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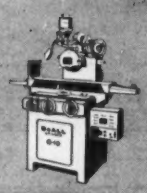
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GAGE BLOCKS

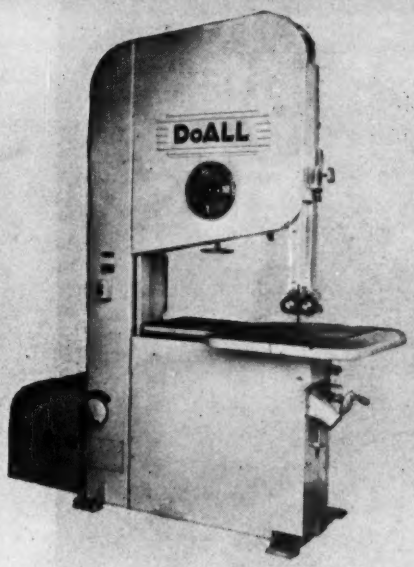


GAGING EQUIPMENT

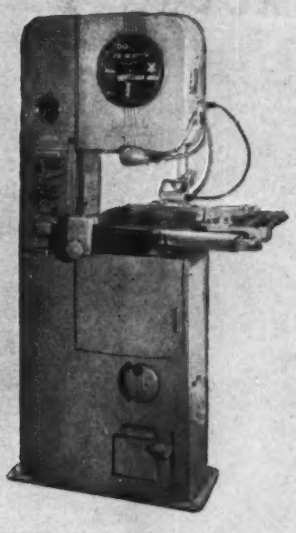


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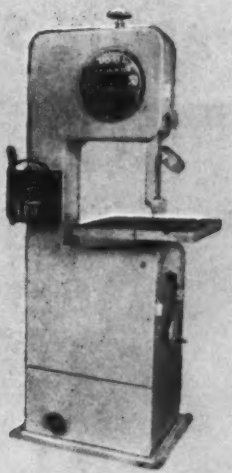
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DoALL "ZEPHYR" MACHINES—For safe high speed sawing, up to 15,000 feet per minute. Widely used for Friction Sawing. Single or variable speed models—16" to 60" throat capacity. Pedal operated or automatic brakes optional on high speed machines.



DoALL CONTOUR MACHINES—For precision bandsawing, filing and polishing in every type of metal working shop. Effortless and precise control of speed and feed result in exceptionally efficient operation and reduced tool cost. Available in 16", 26", 36" or 60" throat capacity with work height under guides as required.



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DoALL *Contour* machines are work horses of the metal shop, handling hundreds of conventional cutting jobs with accuracy and speed.

And, there are special production machines built to order for high output on your special applications.

No matter what your job, there is a DoALL Band Machine to handle it. Call your local DoALL Sales-Service Store or write:

The DoALL Company
254 N. Laurel Ave., Des Plaines, Ill.

"Band Machine Headquarters"

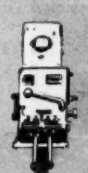
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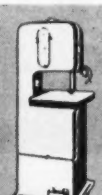
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B-15


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If you've never used this—



maybe you should

It's UNIFLEX...

The new Helically-corrugated Seamless Flexible Tube

If you have a process or application involving flexible metal hose, it will pay you to know a few facts about UNIFLEX. For this entirely new, *seamless* flexible tubing is just coming into its own—in applications too critical for ordinary concentric tubing.

Consider . . .

1. We make UNIFLEX from seamless, special bronze alloy tube—tough, corrosion-resistant, leak-proof.

2. Helical corrugations give UNIFLEX greater flexibility and longer life. Our unique method of manufacture eliminates embrittlement resulting from excessive work-hardening.

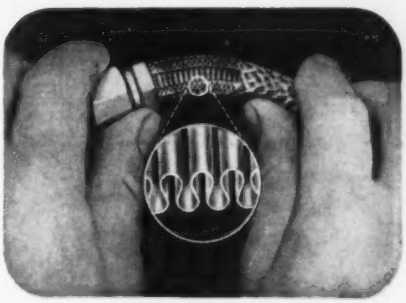
3. For leakless service, UNIFLEX fittings have metal-to-metal seat. Seal is produced through spring washer effect of hose on fitting body.

4. Unlike conventional split-ring collars used on concentric tubing, the *one-piece* UNIFLEX collar hugs 4 or 5 convolutions. This means far less wear—and much greater strength in the connection.

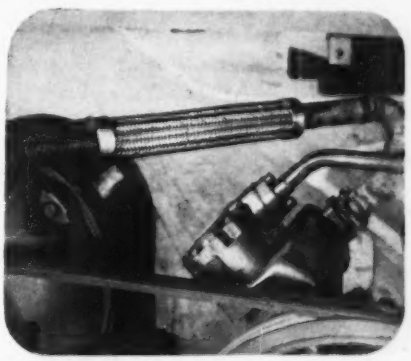
5. UNIFLEX is encased in high-tensile bronze wire braid attached to specially designed couplings. Hose is relieved of damaging strains; sheath prevents elongation, gives extra safety, withstands abrasion.

6. UNIFLEX helical construction distributes flexing between inner and outer surfaces of convolutions—eliminates strain usually limited to one groove. Result: Greater safety and longer life.

7. UNIFLEX fittings are shorter and more compact than most others. This permits the use of more hose length and less fitting length—gives far greater maneuverability, makes it easier to get in and out of tight places.



Note the Helically-corrugated, seamless wall structure of UNIFLEX.



UNIFLEX vibration eliminator used between circulating coils and compressor of a General Electric air conditioning unit. Motor-compressor unit is spring-mounted, requires a flexible connection.

UNIFLEX is supplied in measured lengths, properly fitted and ready for use. You can buy it in sizes from ¼" to 6" ID. It has already proved itself in such applications as hydraulic lines, oil burners, refrigeration machinery, air conditioning equipment, pumps, compressors, diesel engines and machine tools. Our Designers and Engineers have a thorough knowledge of its behavior under exacting conditions. If you'd like to know what UNIFLEX can do for *you* write us about your problem. We'll be glad to help you—without obligation.



Send for your free copy of our new UNIFLEX Catalog. It contains full technical data, sizes, fittings, suggestions for use, and information about new UNIFLEX Quick-soldered Couplings.

Let Our Family of Products Help Yours

Titeflex

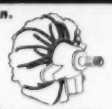
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☐ PRECISION BELLOWS



☐ IGNITION HARNESS



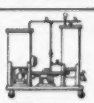
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TITEFLEX, INC.
503 Frelinghuysen Ave.
Newark 5, N. J.

Please send me without cost information about the products checked at the left

MAIL COUPON TODAY

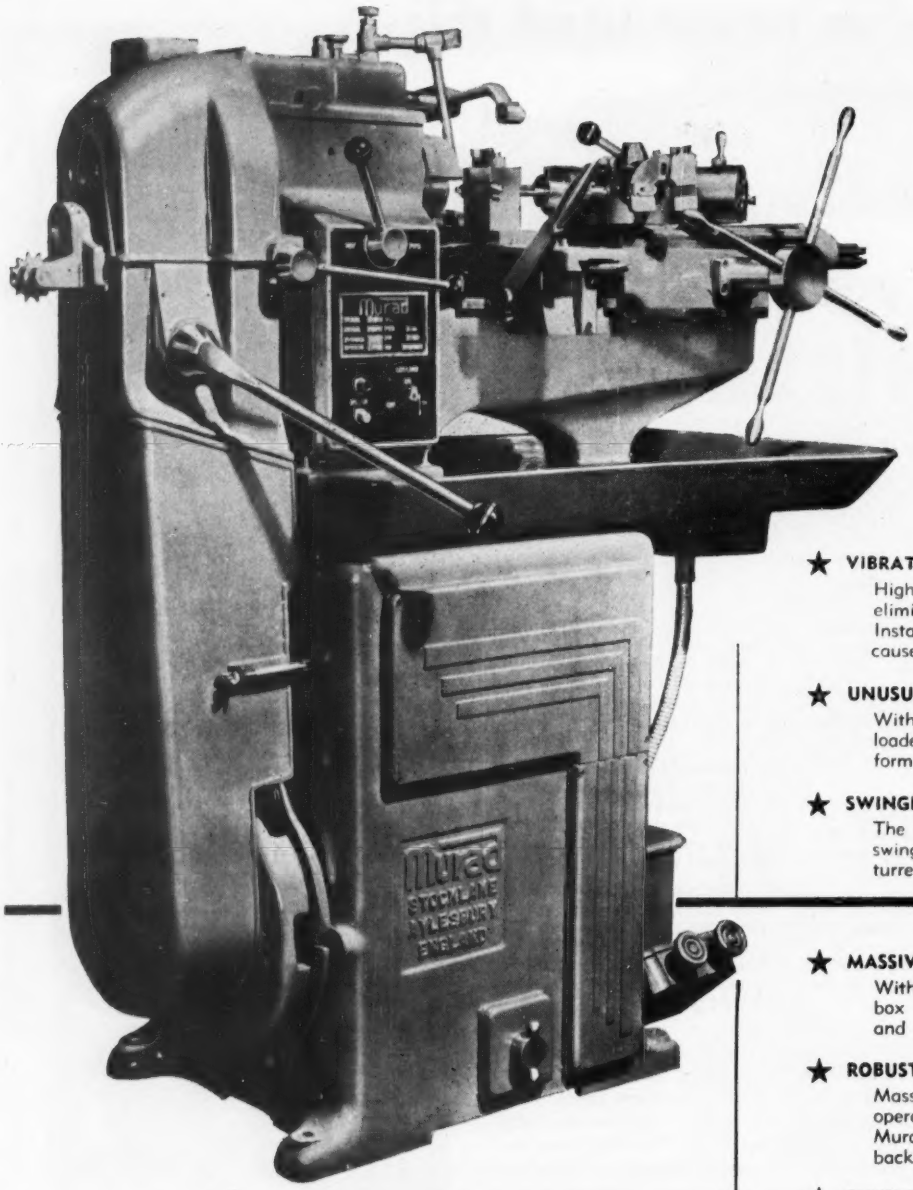
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Murad

ram type turret lathe

Designed and built for increased and improved production, the MURAD ram type turret lathe has a proven record which more than justifies all the claims put forward on its behalf. Special features of design make it unexcelled anywhere for production capacity, accuracy and operative convenience.

★ **VIBRATION-FREE DRIVE**
High spindle speeds with elimination of all vibration. Instant reversing possible because of cushioned drive.

★ **UNUSUALLY LARGE SPINDLE**
With its Hyper-Precision preloaded bearings allow wide form cuts.

★ **SWINGING STOP**
The only turret lathe with a swinging stop giving an extra turret tool position.

★ **MASSIVE BED**
With special positioning of box type ribs giving rigidity and maintained accuracy.

★ **ROBUST CROSS SLIDE**
Massive adjustable screw operated cross slide with Murad micrometer adjustable back tool slide.

★ **CONVENIENT CONTROLS**
Come easily to the hand at the natural height for fast and easy operation.

★ **SPEEDY FOOT CONTROL**
A choice of spindle speeds in the ratio of 1 to 4 instantly available by pedal control.

MURAD DEVELOPMENTS LIMITED, AYLESBURY, BUCKS, ENGLAND

LATHE CARRIAGE FLEXIBILITY

Nichols Miller

PRODUCTION MODEL

Precision turning, boring and recessing jobs that are normally assigned to toolmaker's lathes or expensive boring machines, come natural to the versatile NICHOLS Millers.

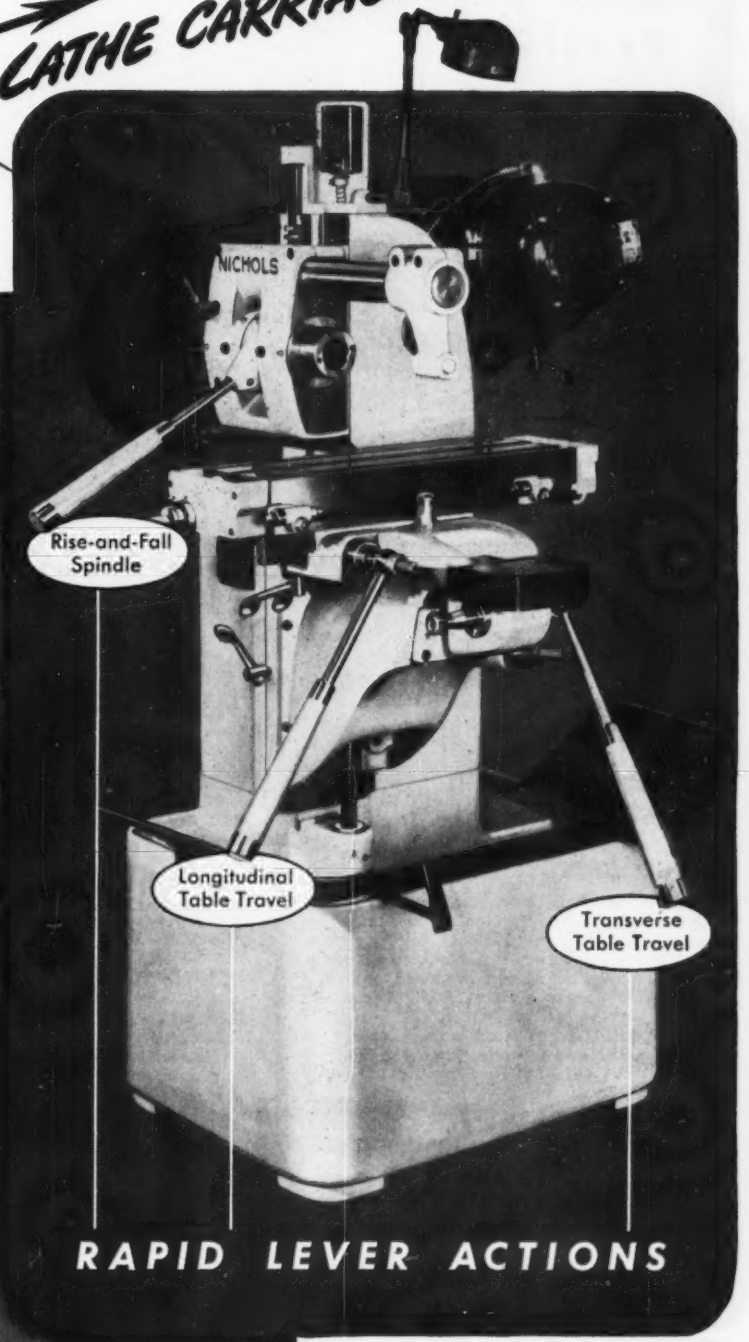
Rapid Lever Actions on the Spindle Head, Table, and Saddle provide unparalleled flexibility of movements. The Lever-Transverse Feed, an exclusive NICHOLS development, is especially valuable. Makes NICHOLS different from other hand millers. It adds *"lathe-carriage flexibility"* to your most intricate machining operations, while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Adjustable positive stops, quick-acting locks on sliding movements, and the highest degree of precision are standard equipment.

"THE MILLER THAT USES ITS HEAD"



Send for free illustrated brochure.



RAPID LEVER ACTIONS

MANUFACTURED BY W. H. NICHOLS COMPANY, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

76-E Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Table Travel	10"
Transverse Table Travel	7"
Vertical Travel of Knee	13"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to	5000 R.P.M.
Weight	1250 lbs.

How to Produce and Measure

Precision Flatness and Finish...

On Metals, Ceramics Quartz and Plastics



Many manufacturers are using the Lapmaster in experiments with flatness and finish. In some cases experimental work is carried on in the laboratory and, as a result of the consistency of this machine in producing precision flatness, larger Lapmasters are put into production in the manufacturing line. One such manufacturer of steering gear assemblies saved considerable time over hand lapping of washers and worms. Schools and manufacturers engaged in restricted defense work are finding and utilizing advantages of the old operation of lapping when produced by modern Lapmasters. If you are interested in precision flatness and finish, it will pay you to investigate the Lapmaster. For instance:

Consistent Flatness of 1 Light Band (.0000116") Opens Countless Possibilities For Product Improvement

Manufacturers of pumps, compressors, and equipment containing liquids or air under high pressures have found it possible to eliminate gaskets in mating surfaces because of the extreme accuracy of work produced by the Lapmaster. Quality of surface (RMS) is controlled by Lapmaster compounds. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can also be held to less than one light band or .0000116". (11.6 millionths of an inch.)



LAPMASTER Monochromatic Lights and Optical Flats

Here's the equipment you'll need for checking accurate lapping.

The Monochromatic Light is a sturdy, completely self-contained and portable precision instrument that can handle any size part. Reversible light head permits checking normal size pieces on the stage, larger parts on a table. Light is of high power to show visible bands on relatively long polished surfaces and materials difficult to check. Power supply is a 5000 volt transformer operating on 110-120 V., 60 cycle current.

Lapmaster Optical Flats offer the most accurate standard of measurement available. They are made of highly transparent quartz which holds its shape indefinitely, is abrasion resistant and resists thermal shock. Flats are available to a standard of either 1/10 or 1/5 of a light band across their diameter.

LAPMASTER'S New Principal in Machine Design Offers Cost Reduction *Plus* Consistent Accuracy

Lapmasters are extremely versatile lapping machines. Precision flatness and super finish can be generated in both small and large production quantities. In one cycle, Lapmasters can precision-lap either identical parts or parts of dissimilar shapes and materials.

Additional Data

on this outstanding machine is available on request. Write today for Bulletin M-9.



JOHN CRANE

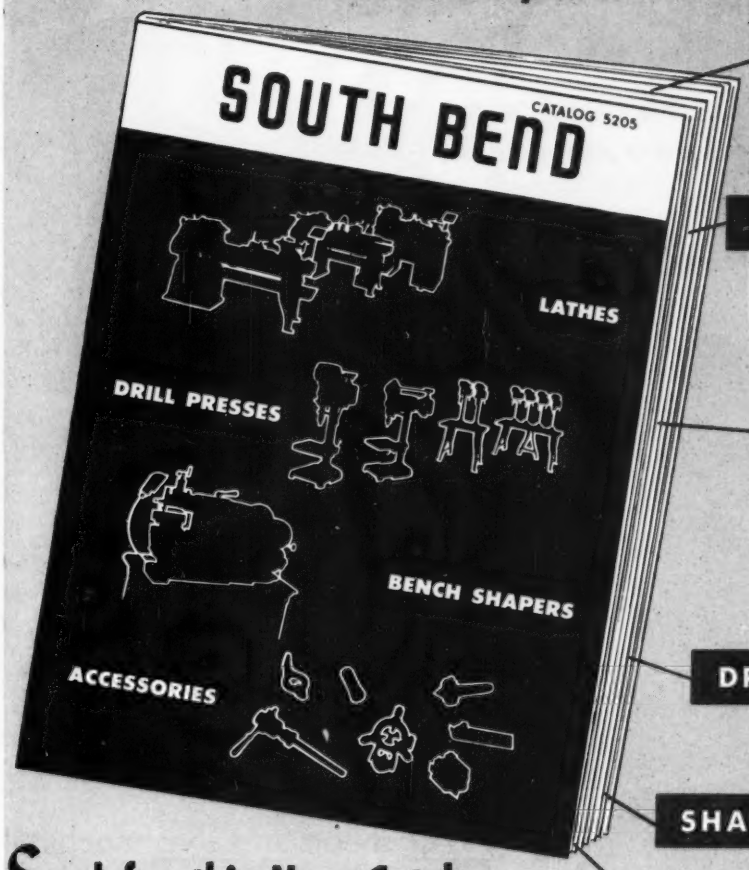
PACKINGS | MECHANICAL SEALS | TEFLON PRODUCTS | LAPMASTER LAPPING MACHINE | PIPE SEALING COMPOUNDS

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1833 CUYLER AVENUE • CHICAGO 13, ILLINOIS

SOUTH BEND

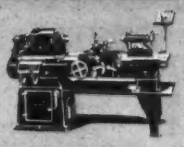
Lathes • Drill Presses • Shapers for *More Efficient Machining*



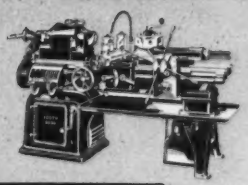
ENGINE LATHES



TOOLROOM LATHES



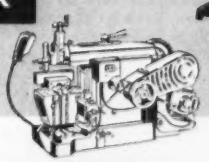
TURRET LATHES



DRILL PRESSES



SHAPER



ACCESSORIES



Send for this New Catalog

This new South Bend catalog contains illustrations, descriptive material and specifications of all sizes and types of South Bend Lathes, Drill Presses and Shapers. It also shows the complete line of South Bend accessories, chucks, tools and attachments. Complete in every detail, this catalog is a valuable reference book which every shop man should have. *Send for your copy.*

PARTIAL LIST OF CONTENTS:

Engine Lathes — 9", 10", 13", 14½", 16" and 16-24" swing.

Bench Lathes — 9" and 10" swing in standard change gear, quick change gear and toolroom models.

Toolroom Lathes — 10", 13", 14½" and 16" swing.

Turret Lathes — ½" collet — 9" swing; 1" collet — 10" and 16" swing.

Drill Presses — 14" capacity Precision and Economy models; also multiple head Production models.

Shaper — 7" bench model with or without stand.

Accessories — for lathes, drill presses and shapers.

SOUTH BEND LATHE, South Bend 22, Ind.

Please send Catalog 5205. I'm particularly interested in

_____

Name _____

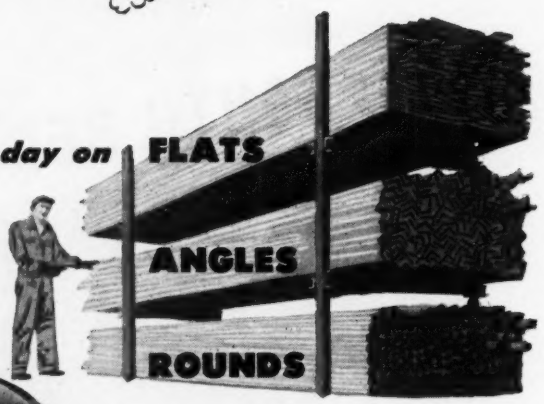
Company _____

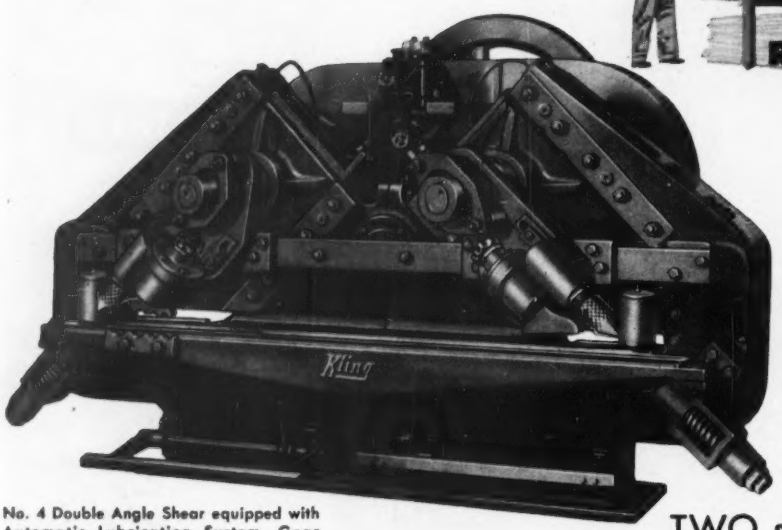
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SOUTH BEND LATHE *Building Better Tools Since 1906* **South Bend 22, Ind.**

It's the BUSIEST machine in the shop!

...gives more cuts per day on **FLATS**





No. 4 Double Angle Shear equipped with Automatic Lubrication System, Gear Guards and Automatic Hold-downs.

Kling double angle shears

TWO shears in ONE machine!

If you're using obsolete, slow-poke methods of shearing, the Kling Double Angle Shear can help you save time and money. This modern compact machine is designed for high speed, high production shearing on both long and short run jobs. Many metal fabricating plants and steel warehouses have found the Kling Shear to be the workhorse of the shop. For instance, one machine will shear round bars and bar angles on the left side while the right side can be used for structural angles and flat bars. The machine is built with the speed and power to handle the bulk of your shearing requirements. For shops with considerable mitre shearing work, Kling Double Angle Shears can be mounted on a turntable to facilitate handling. Automatic hold downs and one-shot lubrication can be furnished when desired. Sizes to handle angles up to 8" x 8" x 1½".

WANT TO CUT SHEARING COSTS?

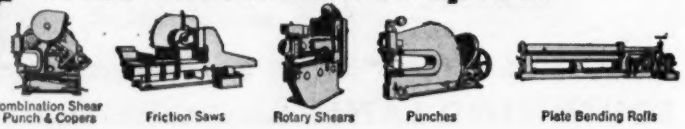
Find out how this high-production machine, available in four sizes, can give you more cuts, cleaner cuts on your shearing operations. Write for more information and latest bulletin. Kling Bros. Engineering Works, 1329 North Kostner Avenue, Chicago 51, Illinois.

SEND FOR NEW BULLETIN 2345.

In our 60th Year

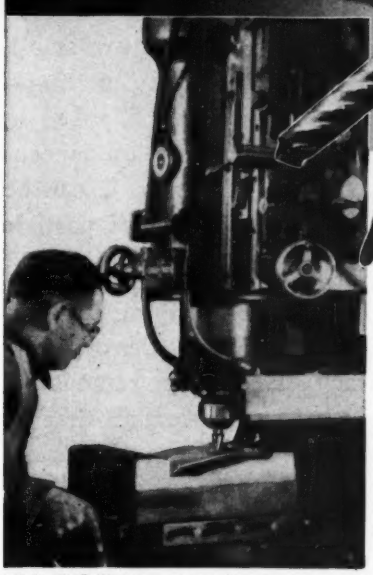
Kling

...an investment in speed!



3509R

LARGEST SELLING CUTTERS FOR TOUGH DIE STEELS!



This T-J Cutter at work on a connecting-rod die block for a board drop hammer. A cutter of right design and heat treatment for this high speed work in tough die steels, making possible maximum efficiency of these machines.

Specify T-J

FOR MORE WORK BETWEEN GRINDS!

In die and forge shops everywhere . . . T-J Die Sinking Milling Cutters are today's top favorites . . . because they're "tops" in performance!

You can raise the feed . . . they're *extra sturdy* for cutting tough die steels! Designed for speed, accuracy and long life . . . T-J Cutters hold a sharp edge longer on job after job . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes . . . *right* to increase the output of your machines and *reduce costs!* Send for new catalog 150. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

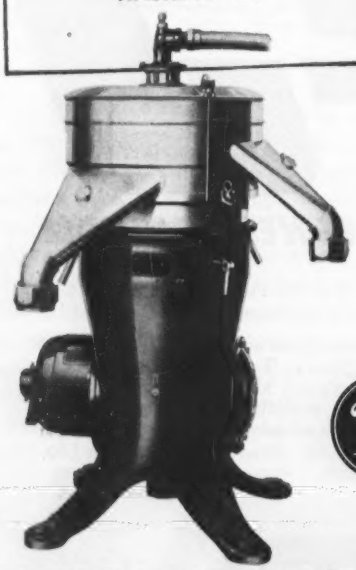
TOMKINS-JOHNSON
DIE SINKING MILLING CUTTERS



NO GETTING AROUND IT

AT LEAST 18 FACTORY OILS CAN PROFITABLY BE CENTRIFUGED

MOTOR BLOCK TEST OIL
BALER OIL • BORING OIL
BRIQUETTING OIL • CABLE OIL
CUTTING OIL • DRAWING OIL
GRINDING COOLANT
ENGINE OIL • HONING OIL
HYDRAULIC OIL • RECOIL OIL
LUBRICATING OIL
SHOCK ABSORBER OIL
QUENCHING OIL
SLUSHING OIL
TRANSMISSION OIL
WASHING OIL



Practically every metal-working plant, large or small, offers many opportunities to use De Laval centrifugal machines. One of the most obvious applications is in the machine tool section. When cutting oil is centrifuged before being returned to the work, it can be reused with perfect safety, for every abrasive particle is removed in the De Laval bowl.

Other typical applications are for purifying test oils and dehydrating slushing compounds. Centrifuging test oil adds to the accuracy of the test; removal of water from slushing compound makes certain that no moisture gets through to impair the protective coating.

There are at least 15 other factory oils that can profitably be purified by De Laval centrifugals. Study the list at the left for those that **you** can reclaim!

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

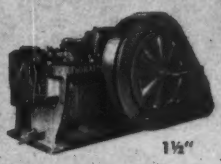
UPSET YOUR TOUGH ONES...

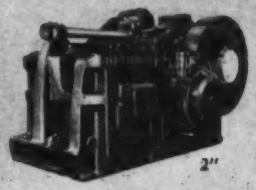
ON NATIONAL FORGING MACHINES!

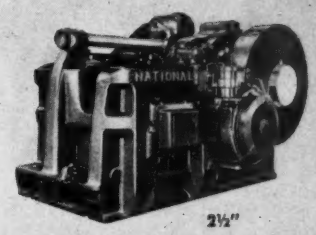
Most forge shops customarily assign the more difficult upset and piercing jobs to National Forging Machines.

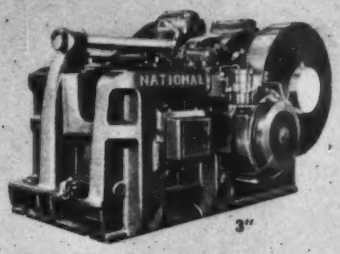
Our broad experience enables us to design and build a line of machines capable of standing up to the toughest forging assignments . . . whether plowshares or high explosive shells.

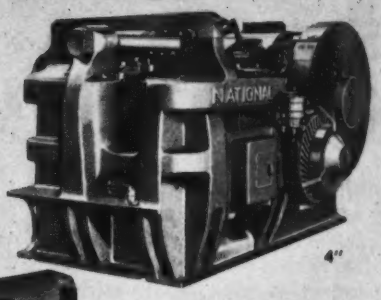

1"

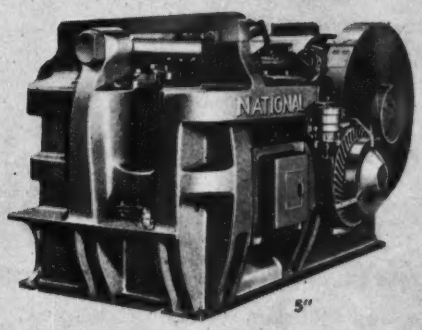

1½"

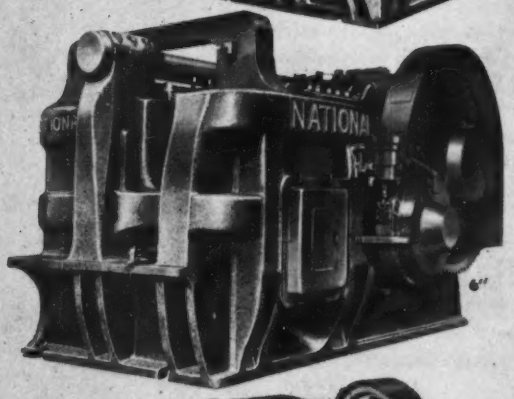

2"

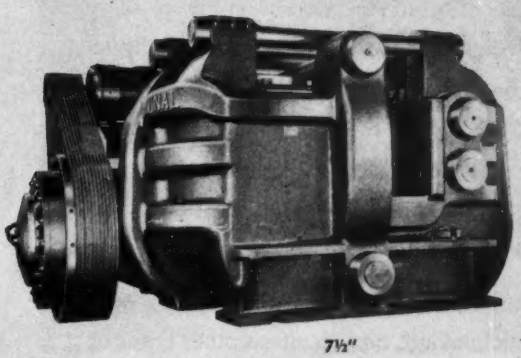

2½"

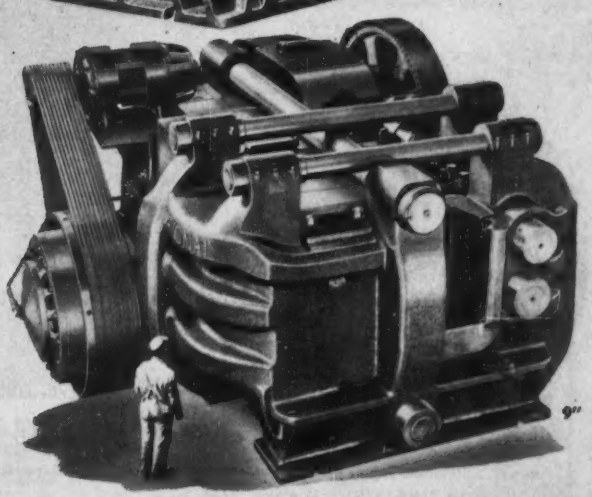

3"


4"


5"


6"


7½"


9"



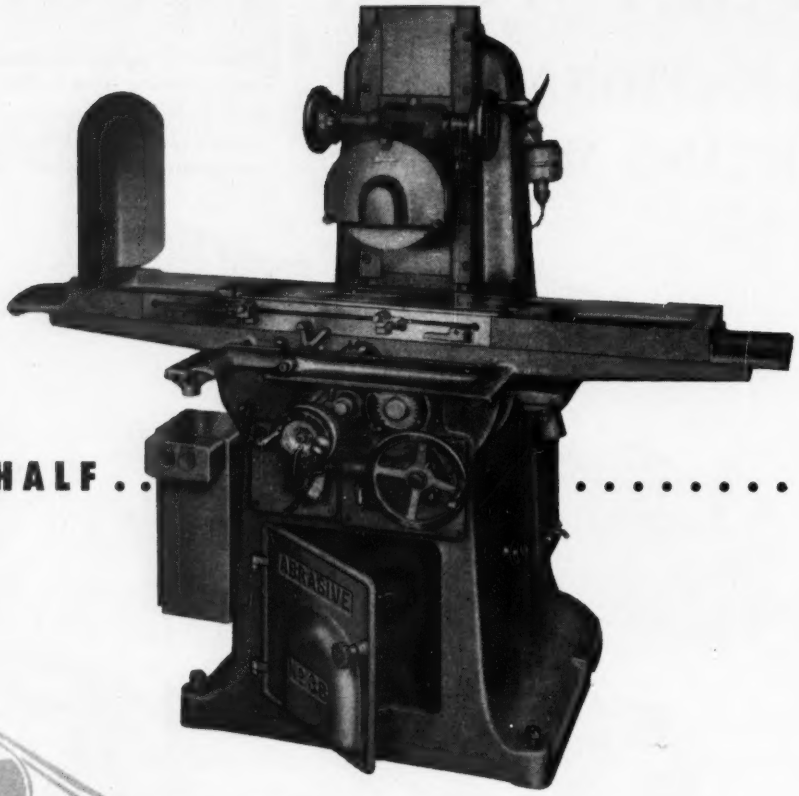
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TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

Hartford **Detroit** **Chicago**



This TON-AND-A-HALF . . . . . *cuts* TIME-AND-A-HALF!

ABRASIVE No. 3-B eliminates costly overtime in production and toolroom surface grinding.

There's 3,000 lbs. of precision workmanship in each Abrasive No. 3B Surface Grinder . . . designed specially to get grinding jobs out on time EVERY TIME! If the job calls for heavy cuts, the No. 3B will take them. If the work must be held within very close tolerances, the Abrasive No. 3B is the grinder for the job. If surface finish is a primary consideration, again it's wise to put the job on the No. 3B.

Wherever high quality surface grinding is required — in automotive, aircraft, toolmaking, and countless other types of plants — you'll save time and trouble by relying on the Abrasive No. 3B. May we send you descriptive Bulletin and complete specifications? Write today to the Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, R. I.

CONDENSED SPECIFICATIONS

TYPE: Horizontal spindle, reciprocating table, mechanical feeds.

CAPACITY: 24" long x 8" wide x 12" high.

FEEDS: Automatic in longitudinal and transverse directions.

Automatic cross feed (0 to .070" at either or both ends of table travel).

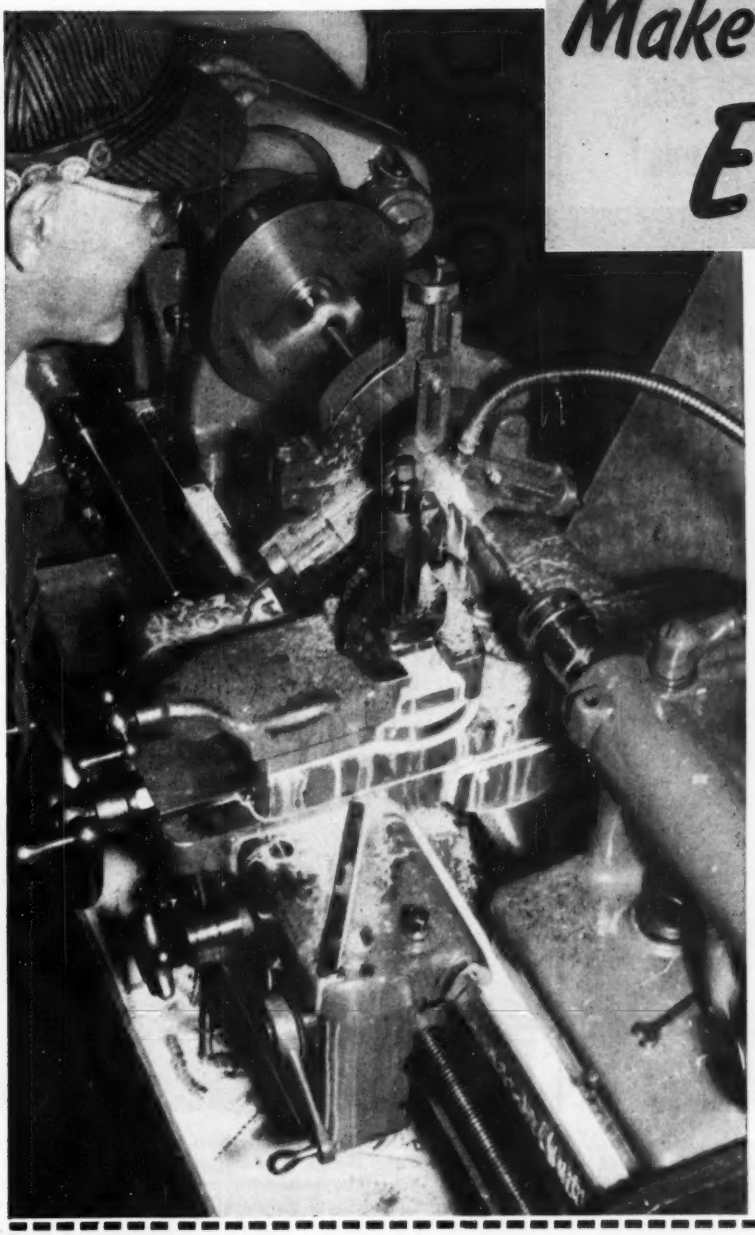
WHEEL: Standard Type 1 — 10" diam. driven by 3 HP, 1750 RPM motor.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality Is Reflected in the Finish of Your Product

SOUTH BEND 14½" LATHES

Make Tough Jobs EASY



When tolerances start slowing up output, then is the time you need South Bend 14½" Lathes. Many plants have found they can save manhours and material by running the tough operations on these precision lathes — this is the type of work they do best. Their versatility enables you to keep them busy on a wide variety of work with a minimum of set-up time. Many attachments are available for special classes of work. Find out now how these lathes can give you efficient machining — *mail coupon today.*

SPECIFICATIONS

SWING: 14⅜" over bed and saddle wings; 10¼" over saddle with chip guard removed.

BED LENGTHS: 5, 6, 7 and 8 feet.

DISTANCE BETWEEN CENTERS: 24⅛ to 60⅛ inches.

COLLET CAPACITY: 1 inch. (Collets interchangeable with South Bend 10"-1" Collet, 13", 16" and 16-24" Lathes.)

SPINDLE BORE: 1⅜ inches.

SPINDLE SPEEDS: Eight . . . 30 to 875 r.p.m.

POWER LONGITUDINAL FEEDS: 48 R.H. or L.H., .0015" to .0841".

POWER CROSS FEEDS: 48, .0006" to .0315"

THREAD CUTTING: 48 R.H. or L.H. pitches, 4 to 224 per inch.

CROSS SLIDE TRAVEL: 10 inches.

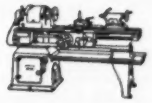
TAILSTOCK SET-OVER: 15/16 inches.

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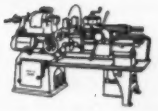
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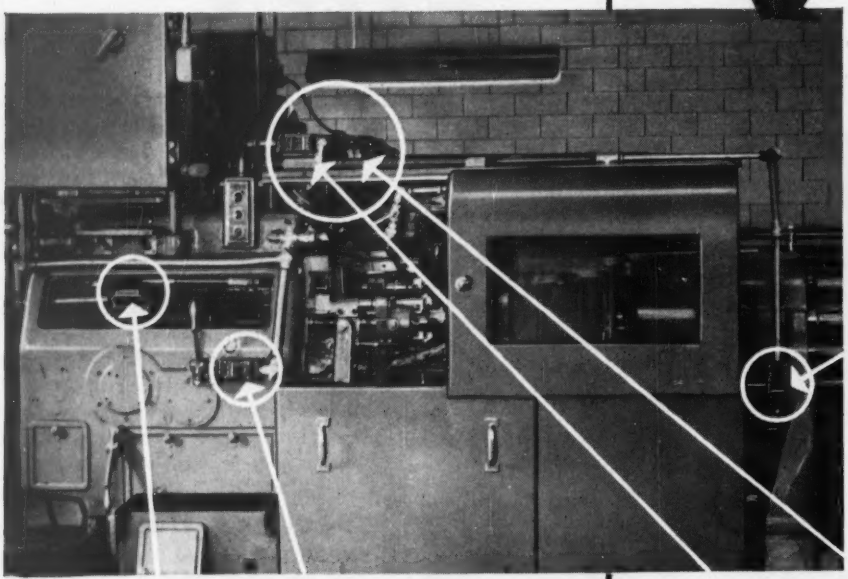
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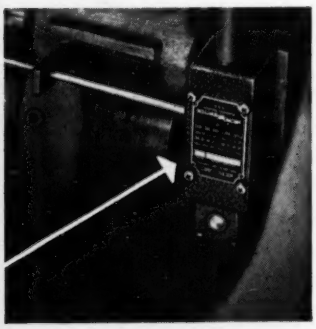
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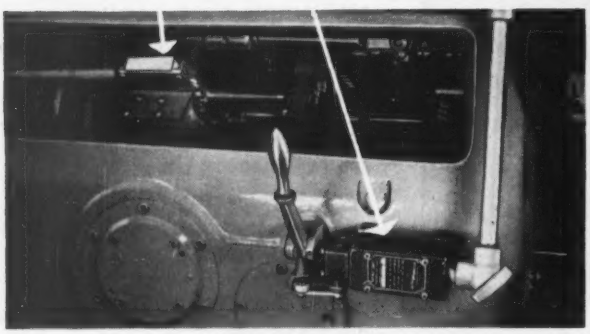
Plant operating men have found hundreds of uses for MICRO precision switches on present plant equipment to make the operation of their machines best fitted to their production needs.

These illustrations show how one plant operating man used five MICRO precision switches to make the operation of a six-spindle screw machine more perfectly adapted to his specific needs.

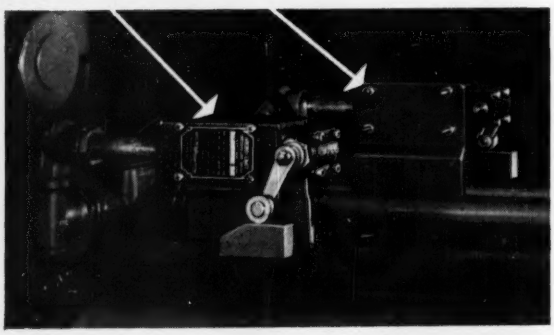




MICRO "5ML1" limit switch (above) that is operated by the chuck closing shoe. This switch must be operated at the same time as the one on the hand closing lever or the machine will stop, thus preventing damage to the shoe and the chuck opening and closing mechanism.



The MICRO general purpose limit switch at upper left has a roller arm actuator. If a part that has been machined becomes jammed in the collet and is not ejected properly, this switch shuts off the motor before damage can occur.
A MICRO "1ML1" limit switch is operated by the hand starting lever as shown at lower right. If the collet is not fully closed, the machine will not start.



The MICRO "1ML1" heavy duty limit switches shown above operate when the shields on either side of the machine are slid open. This action operates one or the other switch which shuts off the power until the shield is reclosed. This adds to safety of the operator and keeps oil from splashing on the floor.

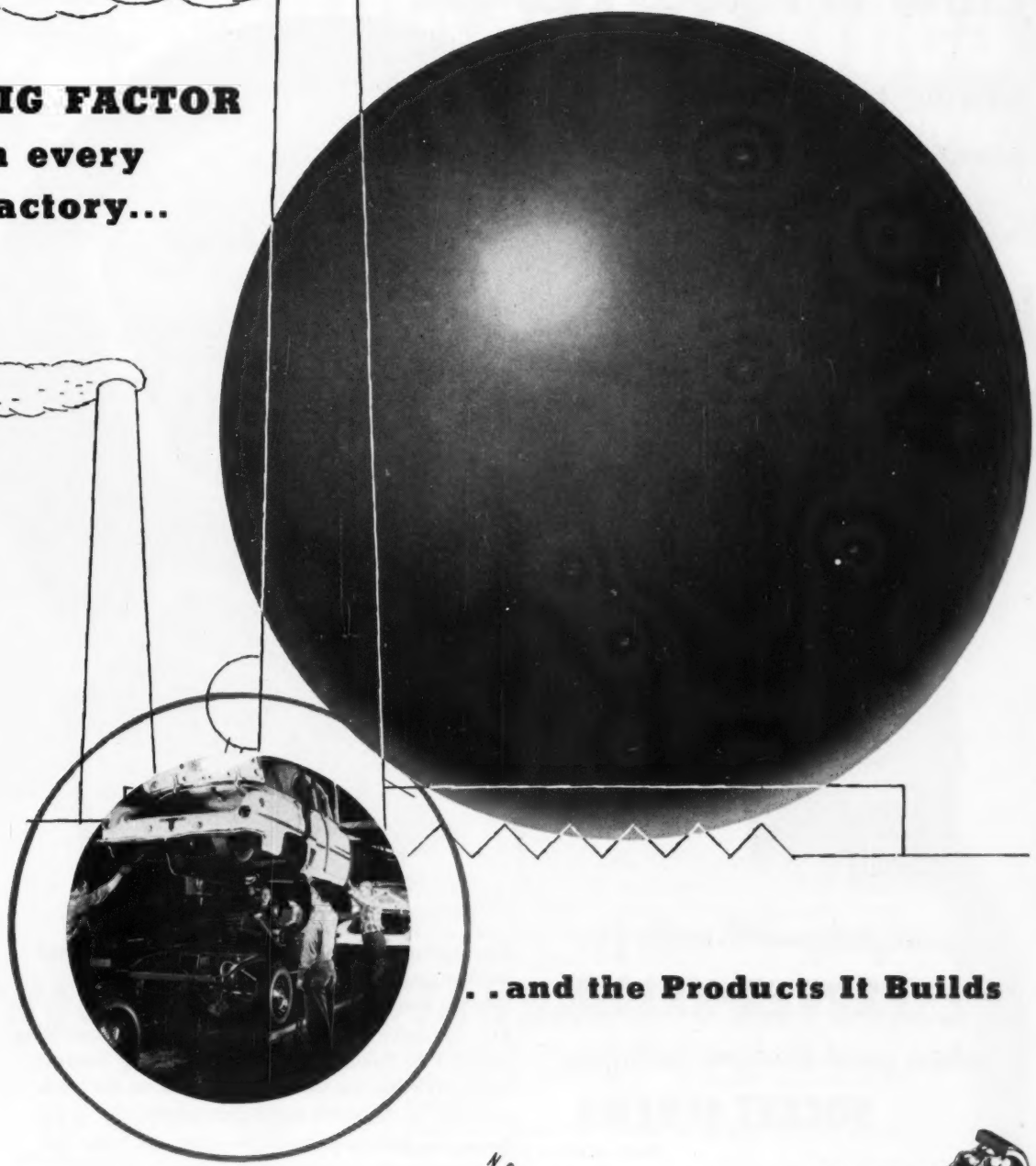
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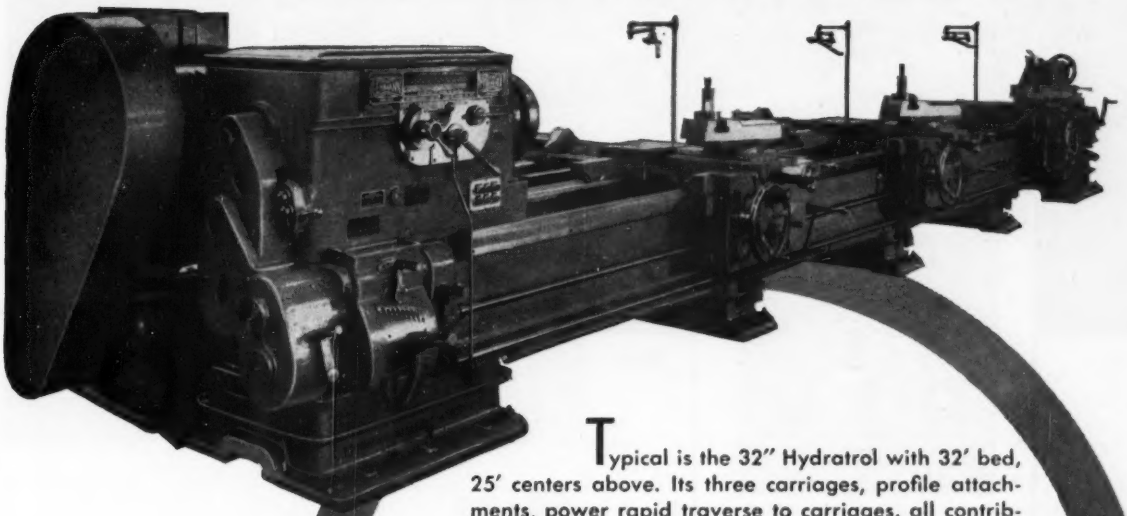


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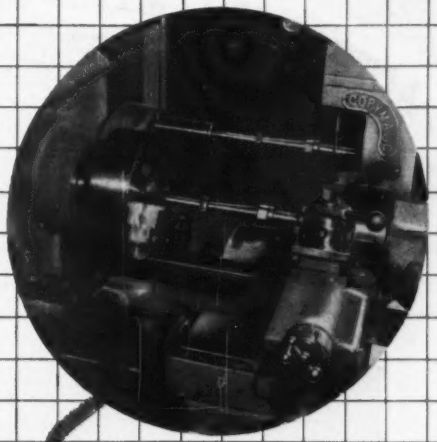
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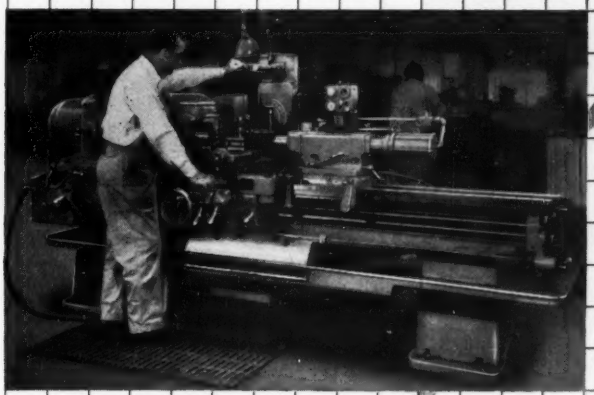
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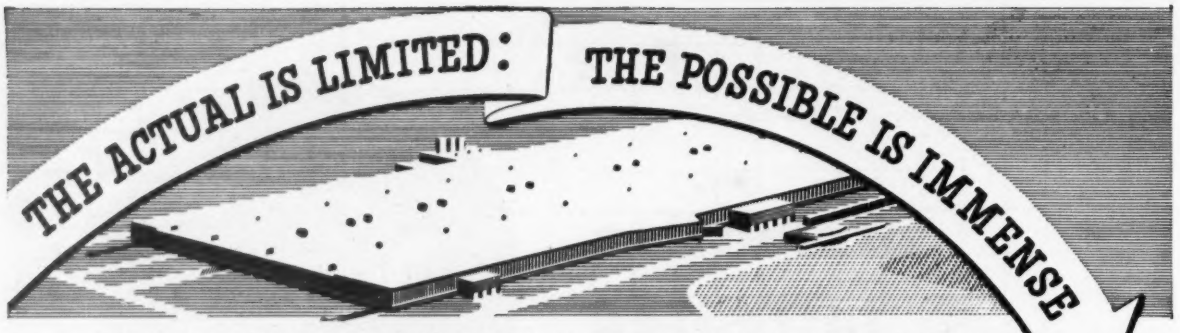
COPYMATIC form turning various oil well equipment items at Otis Engineering Corp., manufacturing affiliate of well-known Otis Pressure Control, Inc., Dallas, Texas.

In the production of sub-surface controls which must be placed and operate in oil well casings far underground, the precision and speed of the Lodge & Shipley COPYMATIC Lathe are valuable assets. This manufacturer says, "tolerances can be held closer . . . the COPYMATIC can be used as tracer type or conventional lathe . . . is very easy to operate."

On a typical job, 303 Stainless is turned for O.D. and taper at 549 RPM and .0067" feed, using Kennametal K3H tools. On this and other jobs involving form boring and threading, the user "has been very successful in decreasing production costs over the use of conventional lathes."

In any size shop . . . on a multitude of operations . . . the speed and versatility of the COPYMATIC, coupled with the accuracy of the Lodge & Shipley Model X Lathe, turns out more work at lower cost. For additional case histories, complete details, write:

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NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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WELDED DESIGN INCREASES RIGIDITY WITHOUT INCREASING COST

By **Eric Hartmann,** Experimental Research Engineer
The Porter Cable Machine Co., Syracuse, New York

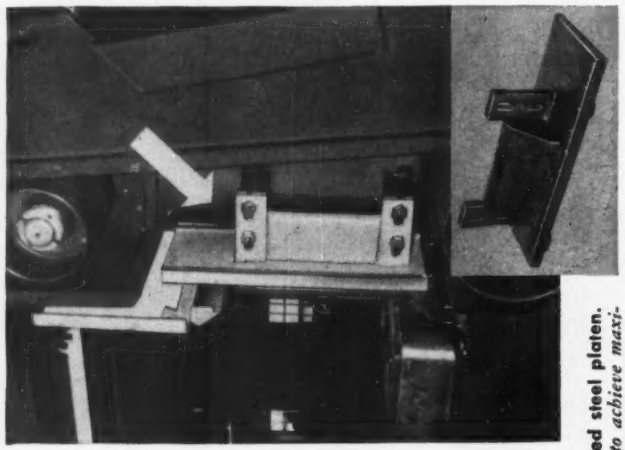


Fig. 3—Detail of Column *on Porter Cable BG-8 Grinder. Shows assembly of belt platen support governing the ultimate accuracy and efficiency of the machine.*

Inset: Rear view of welded steel platen. *Shows efficient use of steel to achieve maximum strength and rigidity per pound of metal.*

BY changing over the design of our belt platen support to welded steel construction, we have cut deflection over 90%. The former cast construction, (Fig. 1) would deflect from .017" to .020" under 400 pound table pressure. The present welded steel design deflects only .0015" to .002"...10% of its original value.

Since steel is 2½ times more rigid than gray iron, it was possible to develop a more efficient product design on the platen itself without changing the basic dimensions of the machine or without increasing costs. On machine tools like ours, rigidity is basically important as it directly affects ultimate accuracy and efficient operation of the equipment.

WELDED DESIGN ALWAYS SAVES STEEL AND LOWERS COST

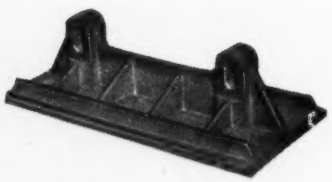


Fig. 1—Former Design—*Belt platen support for grinder was originally a casting. Required machining operations to finish the front face and the mounting arms.*

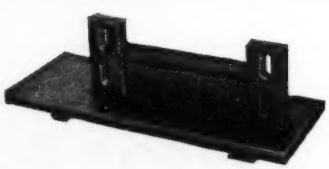


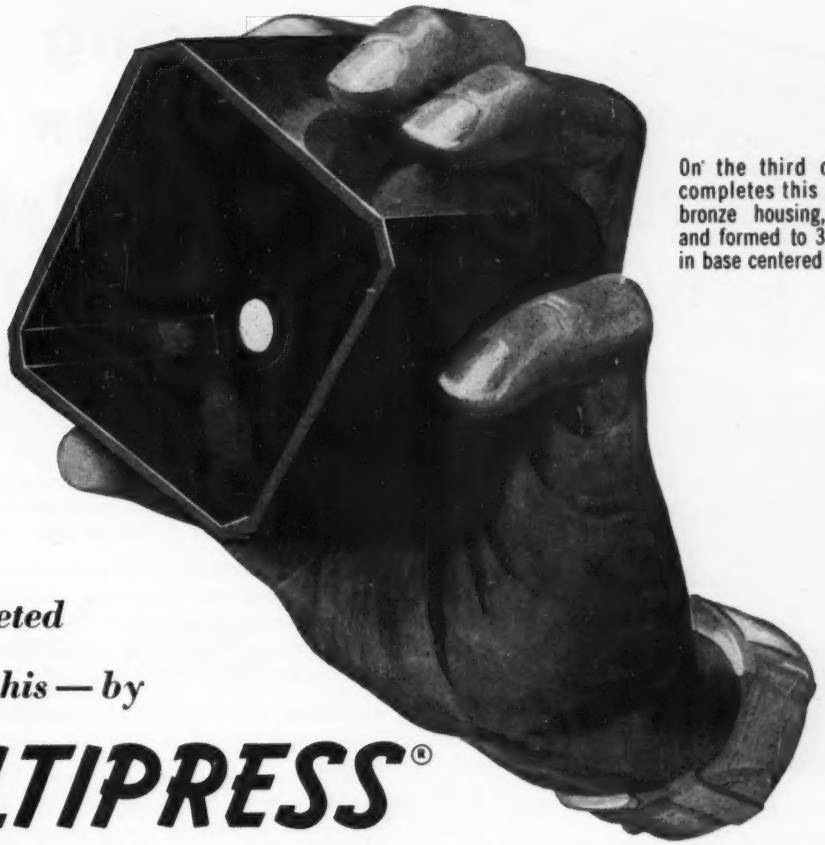
Fig. 2—Present Design in Welded Steel—*Is simpler to fabricate than the original construction. Components are pre-machined prior to welded assembly to simplify manufacture.*

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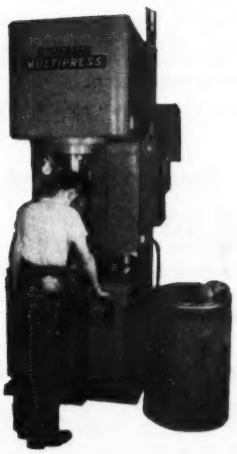
On the third draw Multipress completes this .064 phosphorus bronze housing, precision-drawn and formed to 3-inch depth, hole in base centered in embossed ring.

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on the THIRD DRAW

Deep-drawing jobs average 50% FASTER at Hudson Tool and Die



Multipress offers eight frame sizes... one to 50-ton capacities . . . manual or automatic controls . . . index-table, dial, and harmonic stock feeds . . . many other standard accessories for special needs.

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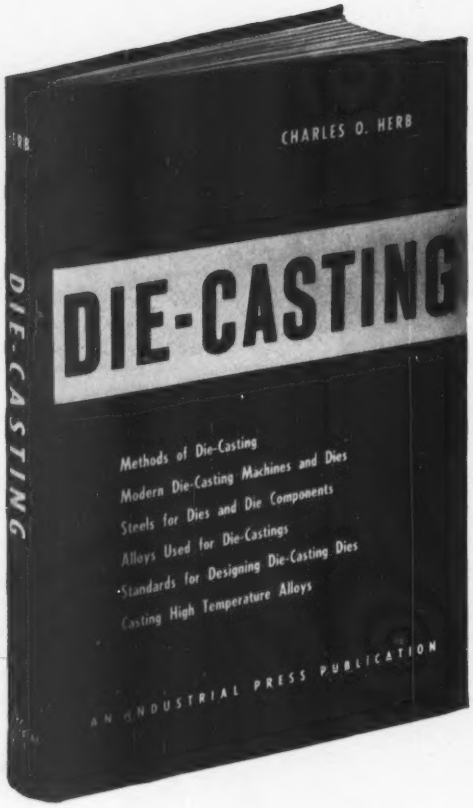
(Hudson Tool & Die already has a second Multipress on order, as this is written, and is planning for additional units in the near future.)

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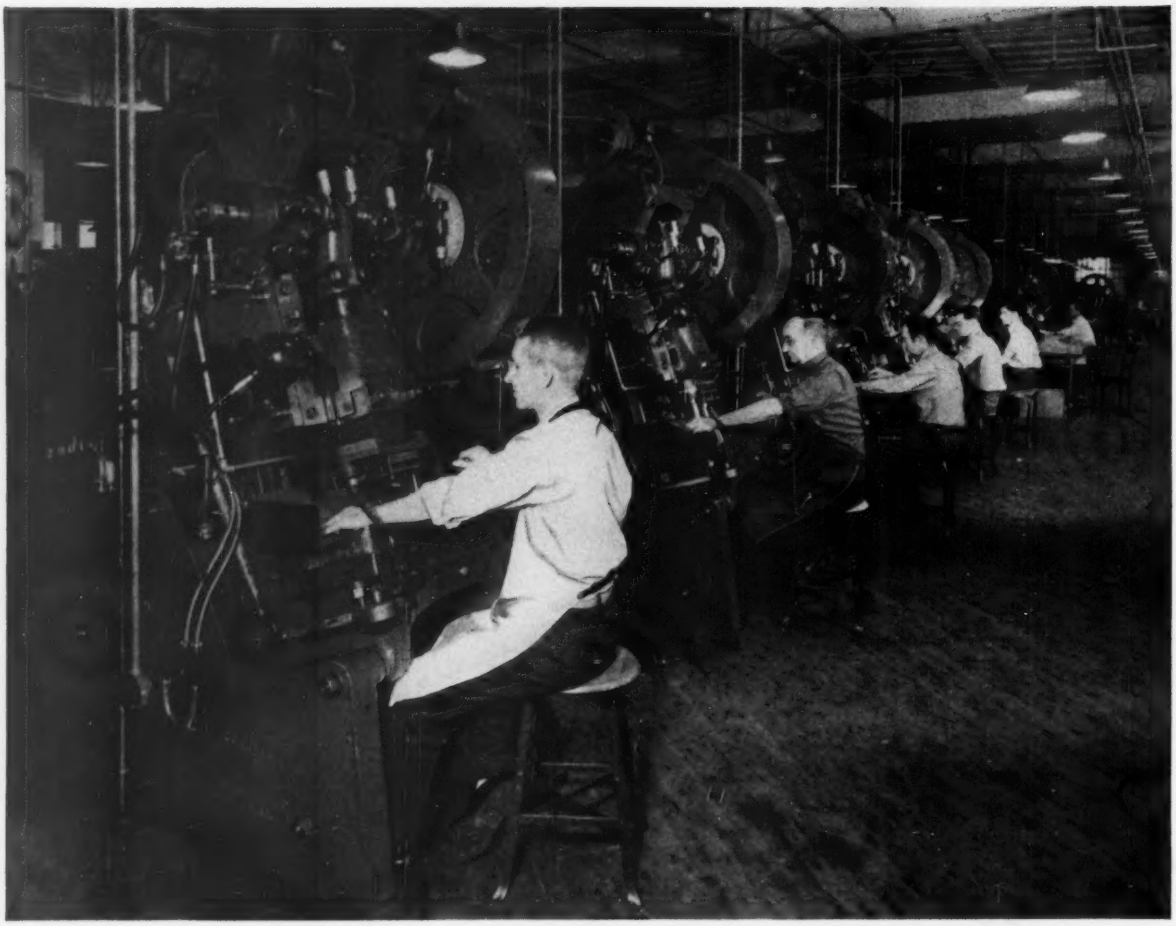
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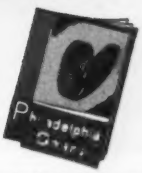
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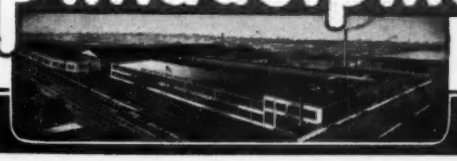
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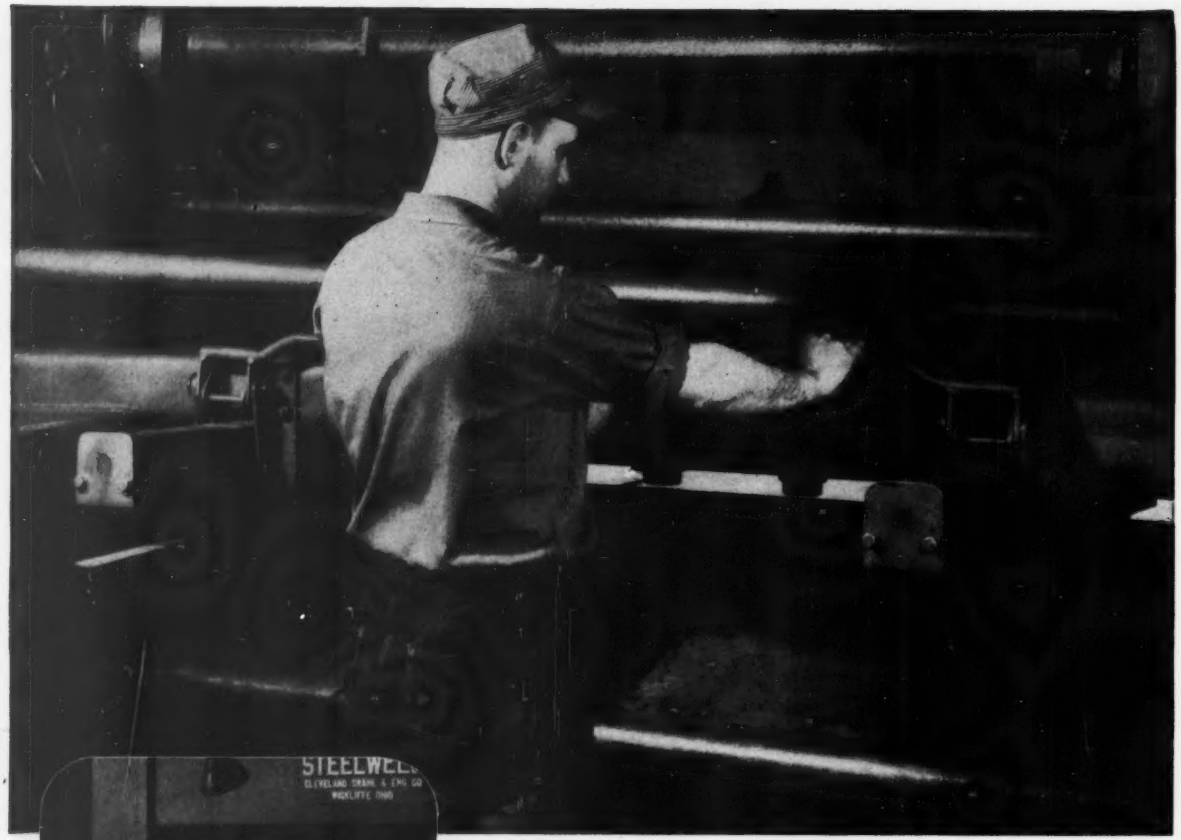
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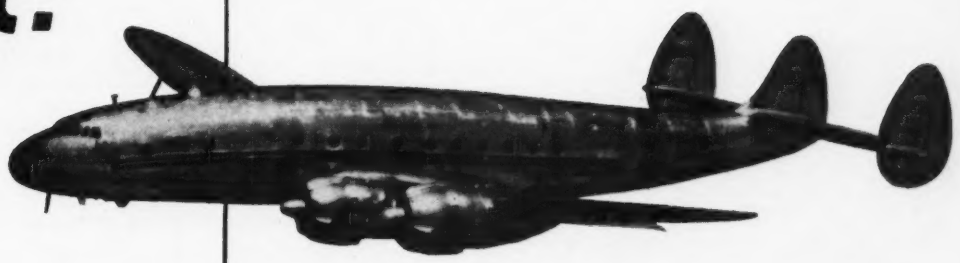
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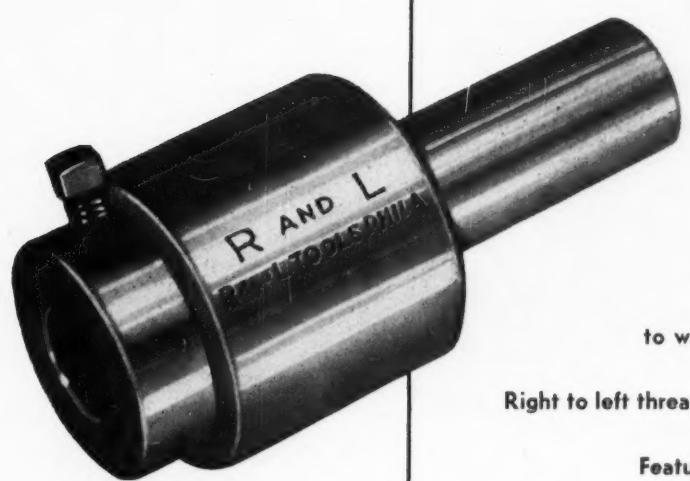
CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
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STEELWELD PIVOTED BLADE SHEARS

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THE R AND L TAP AND DIE HOLDER

Instant engagement at full contact!

Fast kick out clutch! No spring plungers

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Right to left threading instantly with new release mechanism!

Featured only in The R and L Tap and Die Holder!

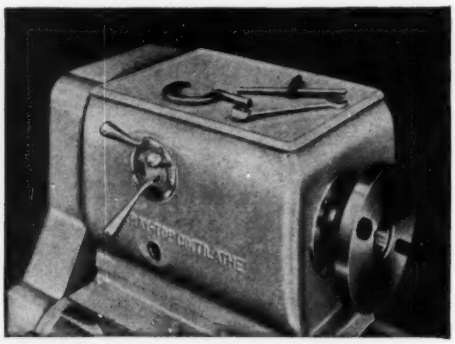
Write for complete catalog of R and L products

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

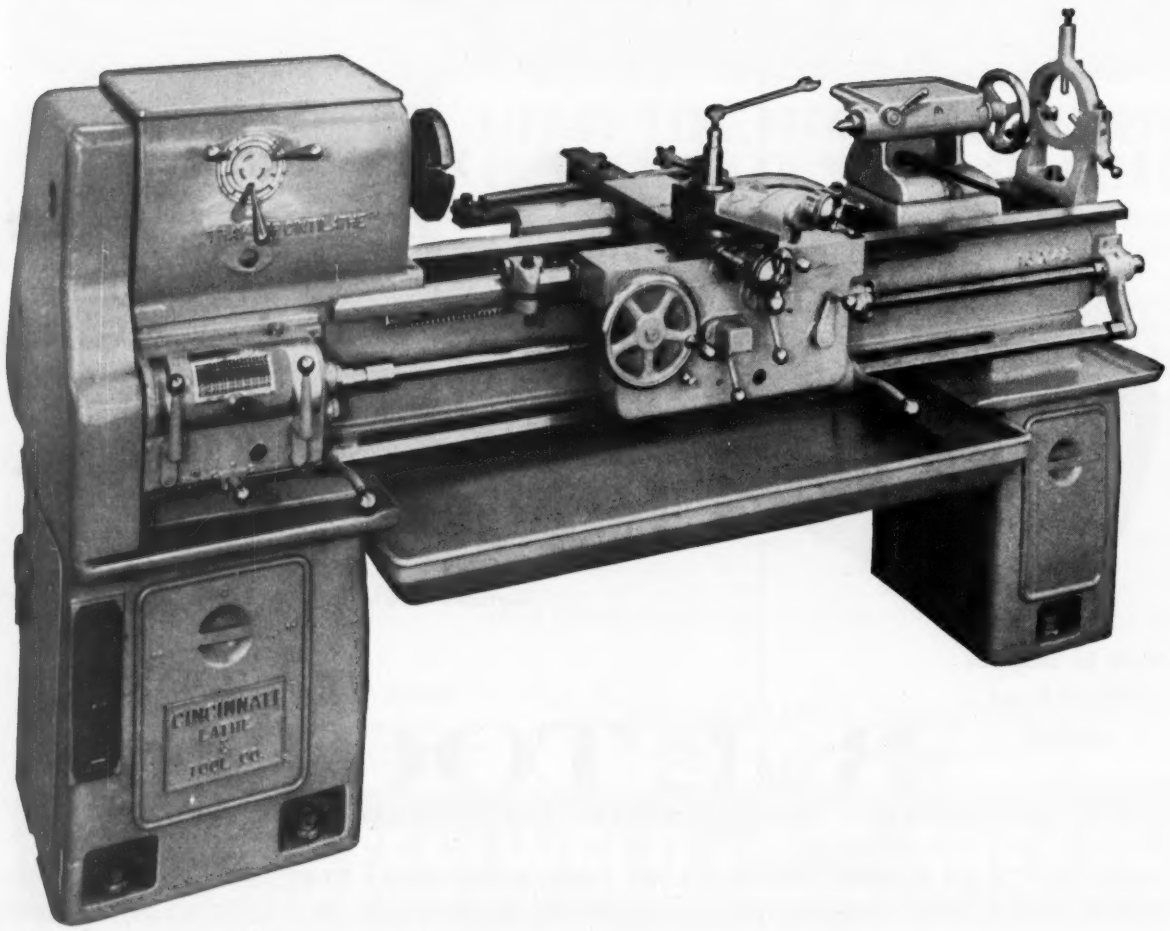
TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

can you top this for convenience ▸



Tray-Top Cintilathes keep mikes, tools, drawings and accessories close at hand, save operator's time for productive use. Other features include all geared head, totally enclosed quick change gear box, 12 speeds, 48 thread and feed changes, start-stop control on apron, large spindle hole, flame hardened gears, ground bed ways, accessible externally mounted main drive motor and many others. Yet Tray-Tops are budget-priced. Swing sizes: 10", 12½", 15" and 18". Write for catalog and name of your nearest dealer.

CINCINNATI 9, OHIO, U.S.A. **cincinnati lathe & tool co.**



Announcing the new SIP jig boring and *milling* machine

Hydroptic-6

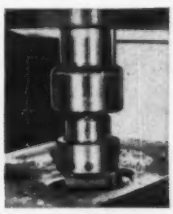
with viewing screens for table and spindle head settings

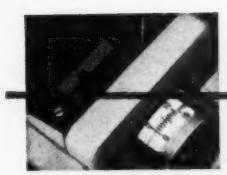
OUTSTANDING ADVANTAGES :

1. **Exceptionally rapid co-ordinate settings** on the magnified image of the built-in standard scales.
2. **Powerful spindle head** incorporating a self-contained drive and a spindle mounted at the nose in double taper roller bearings.
3. **Large free distances** between uprights and between table top and spindle end.









For Further Information
Send for our bulletin No. 1036a

SPECIFICATION

Working range	40 in. × 28 in.
Table working surface	43 1/4 in. × 33 in.
Maximum distance from table top to spindle end	35 1/2 in.
Free space between uprights	43 1/4 in.
Hydraulic feeds	from 12 in. to 100 in./min.
Spindle internal taper	Morse No. 4
18 speeds	from 40 to 2000 r.p.m.
Spindle quill travel	10 in.
Boring capacity	12 in.

Graduation of standard scales built into the work-table and the spindle head saddle		0.1 in.
Size of viewing screens		9/16 in. × 2 7/16 in.
Reading on external auxiliary scales		0.1 in.
Reading on screen micrometer drums	dial	0.001 in.
	vernier	0.0001 in.

Guaranteed setting accuracy: .00015in.

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N. Y.

WERNER MILLERS

From PIGMY Size 0 to GIANT 5

VERTICAL: Size 0 to 5
Table sizes 22"x7" up to 90"x20"

PLAIN: Size 0 to 4
Table sizes 22"x7" up to 76"x15½"

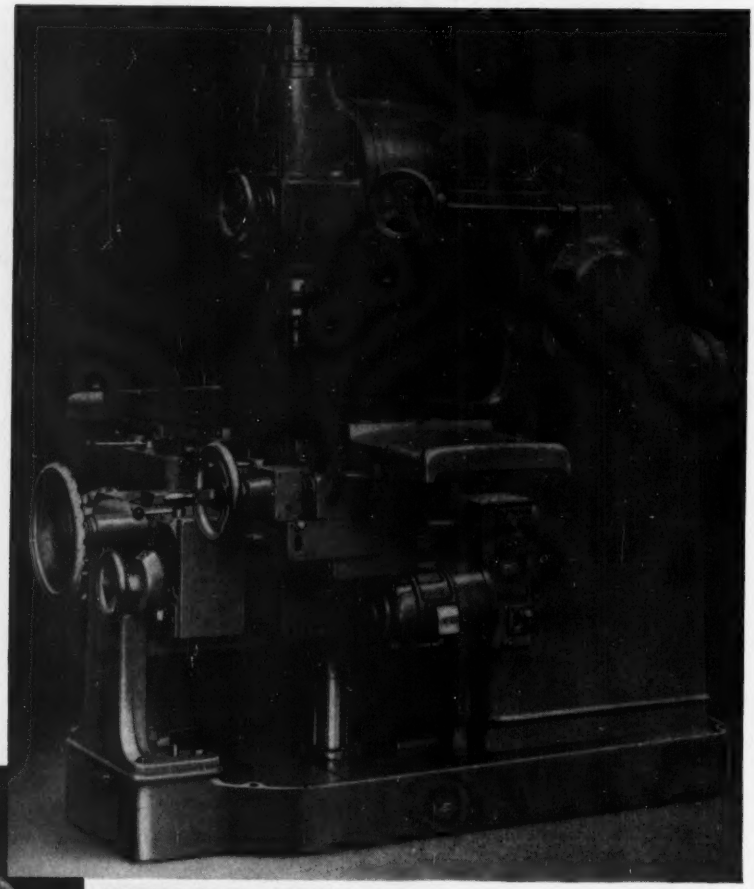
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Table sizes 29"x8" up to 76"x15"

also

MANUFACTURING MILLERS:
Sizes 1, 2, 3 2-19, 3-25



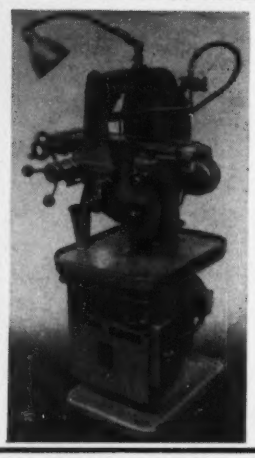
No. 0 Vertical



No. 4 Vertical



3-25 Manufacturing



No. 0 Horizontal

PROMPT and REASONABLE DELIVERIES

For further information about these, and other machines contact Dept. M

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Create an impression of high quality at first glance which will remain as a long-lasting sales asset after the day of delivery. This formula can often be applied *with*

MADISON-KIPP ZINC AND ALUMINUM DIE CASTINGS



The earmark of high quality is immediately apparent even on so simple a part as the die cast Oil Level Stick, here illustrated. Prospective buyers can quickly see and feel the difference.

You may find it very profitable to use Madison Kipp die castings for your new parts or the parts you expect to redesign. Please send all correspondence to our home office in Madison, Wis.

MADISON-KIPP CORPORATION

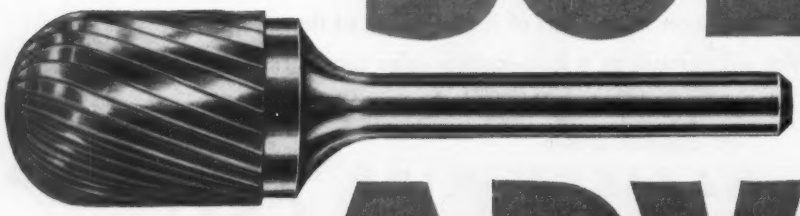
203 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

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Order ATRAX Tungsten Carbide Tools Ground-from-the-Solid



We can prove to you that it pays off to specify ATRAX precision tools ground-from-the-solid. It pays off in longer service, less production difficulties —and that means better profits for you. Send for our complete catalog, or let our engineers consult with you about your needs.

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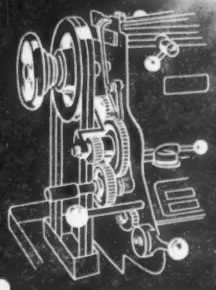
THE ATRAX COMPANY

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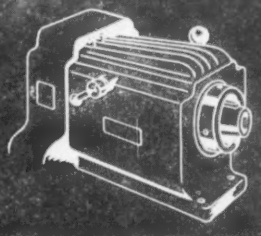
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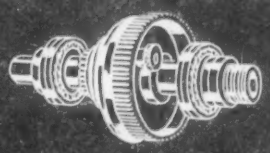
CLAUSING 6300
12" HEAVY DUTY PRECISION LATHE



• OUTBOARD DRIVE



• 1" COLLET CAPACITY 1⅜" BORE
ASA-L-00 TAPERED KEY DRIVE SPINDLE



• TIMKEN BEARING EQUIPPED

If your operations call for a precision 12" lathe of heavy-duty caliber, check your requirements against the capacities of the Clausing 6300. This outstanding lathe incorporates many features that bring new machining speed and efficiency. Forged steel spindle with tapered, key-lock nose—Timken tapered roller bearings—heavy-duty precision V-bed—quick change gears—splash lubrication of headstock, apron, and quick change gears—these are only a *few* of the reasons why the Clausing is such a great lathe value. Check all its features—at your Clausing distributor's, or send for catalog. Delivery is prompt on priority-rated orders.

CLAUSING DIVISION
ATLAS PRESS CO.
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DIVISION ATLAS PRESS COMPANY
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the hand or power blade you need...
to cut any metal at maximum speed!



Standardize with

Silver Steel®

highest grade
HACKSAW BLADES

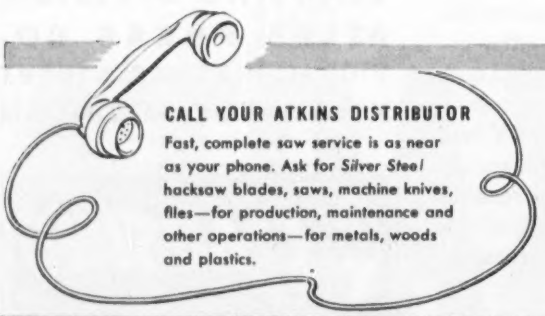


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Atkins Silver Steel hacksaw blades come to you in a wide selection of sizes and specialized grades—in hand, power and coarse tooth power types. They meet any metal-cutting requirement. They give you longer blade life . . . more cuts per blade . . . less down time for machines . . . lower total sawing costs.

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AAA
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CALL YOUR ATKINS DISTRIBUTOR
Fast, complete saw service is as near as your phone. Ask for *Silver Steel* hacksaw blades, saws, machine knives, files—for production, maintenance and other operations—for metals, woods and plastics.

ATKINS

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TWO JOBS AT ONE TIME. A manufacturer of automotive sleeve bearings cleans steel-backed, babbitt-lined strips continuously in an automatic machine. Osborn Master® Wheel Brushes remove all dirt, rust and metal particles from the steel surface. At the same time, Osborn Monarch® Sections clean the babbitt side.



CENTERLESS BRUSHING. This centerless grinder does double duty in the production of nickel-moly steel pump rods. As a grinder, it rough-grinds, then finish-grinds the rod. Then wheel is replaced with an Osborn Fascut Brush for obtaining of smooth finish. Makes rods and pump packing last longer.

Want to take a slice off your finishing costs?

Here's the key to better product-finishing and lower costs: Have your nearby **O**sborn **B**rushing **A**nalyst study your present finishing operations. In hundreds of plants, he is applying the latest developments in brushing techniques to improve finishing quality and increase production.

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STRATEGISTS. Experienced Osborn research men and design engineers help your engineers develop basic brushing methods and brushing machines to solve cleaning and finishing problems. Their services are yours as a part of the comprehensive service offered by your Osborn Brushing Analyst. Call your nearby **OBA.**

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



ACCURATE ALIGNMENT INSURES CLEAN-CUT STAMPINGS

Waltham Sub-Presses can materially lower costs and increase output on small, complicated punchings and stampings. The overhang type is ideal for second or third operations, its fully exposed front and rear openings providing ample light and space for locating work. The arch type is especially suitable for strip work. Rigid construction of both designs, with plunger bearings adjustable for wear, assures accurate alignment. Built in sizes from 1 3/16" to 6" plunger diameter. Write for bulletins describing Waltham Sub-Presses and Waltham machines for thread milling and gear cutting.



WALTHAM MACHINE WORKS
Newton St., Waltham, Mass.

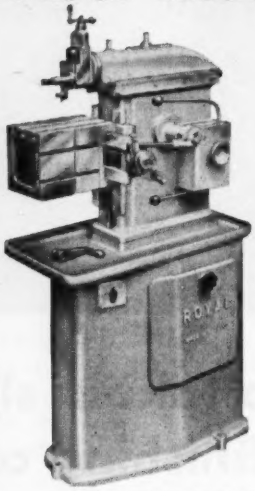


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The Grant Mfg. & Machine Co.
N. W. Station — Bridgeport 5, Conn.

No Priorities -- Prompt Delivery

'Royal' 10" Stroke Floor Model Shaper



Your Best Bet for Removing Metal

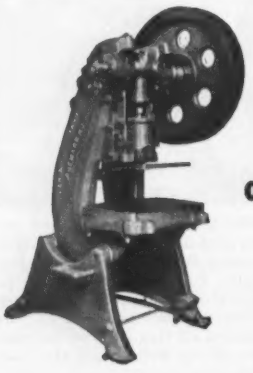
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Motor and vise included.

A good investment because of its compactness, low power consumption, large metal removal rate and moderate cost. Power feeds to table transversely and vertically. With swiveling box table. Toolhead swivels through 120°. Good service on spare parts. Write for literature —no obligation.

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POWER PRESSES

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COMMERCIAL TOOL HARDENING AND HEAT TREATING

Strictly Modern Equipment, Backed by the Skill and Judgment of 40 Years' Experience. Also, We Sell "Heat-Easy" Compound for Pack Hardening High Speed and High Carbon—High Chrome Steels.

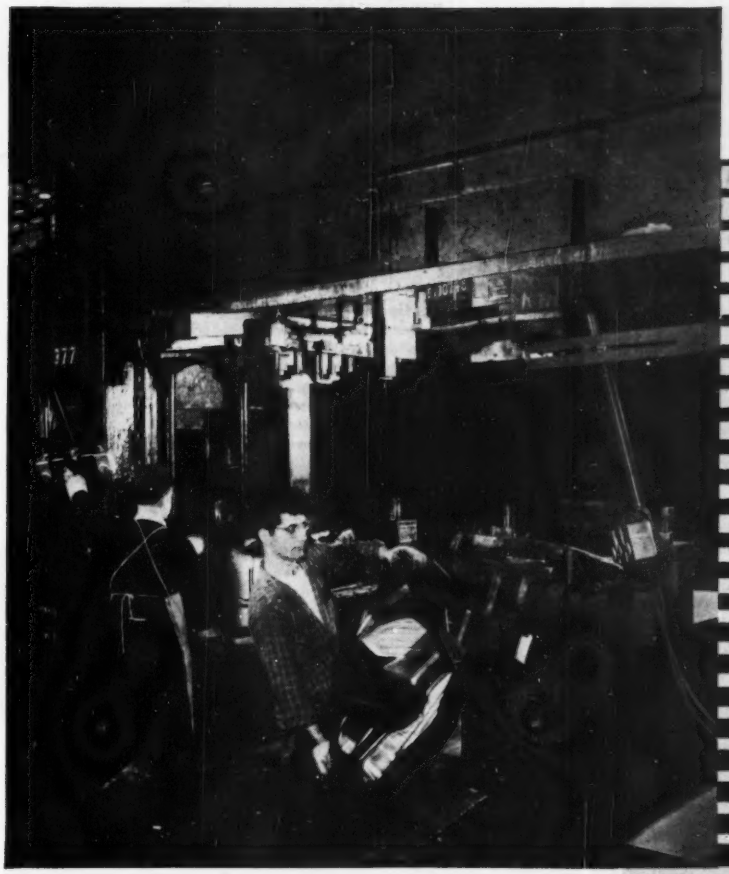
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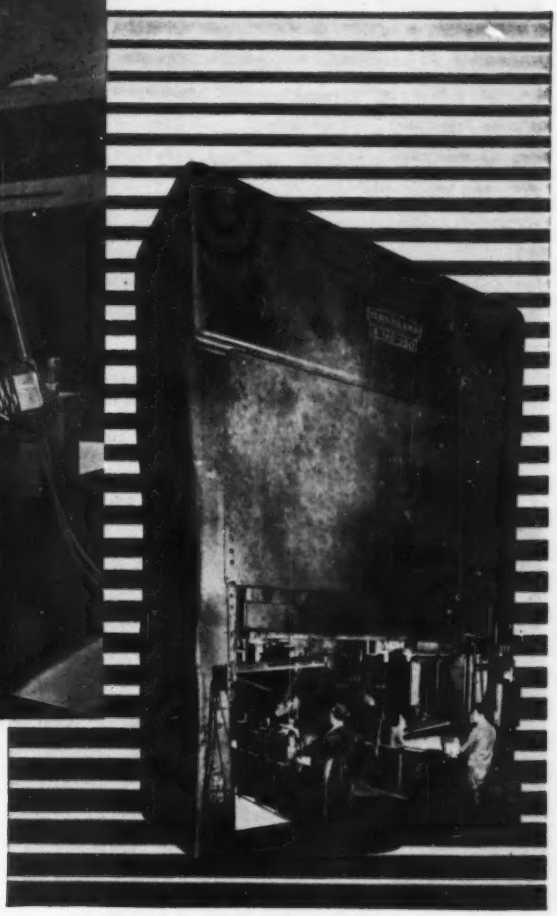
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PATENTED CUTTING OFF TOOL HOLDERS
PATENTED CUTTING OFF BLADES

ONLY the PATENTED construction of LUERS cutting off BLADES permits radial expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured by
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of versatile precision...

In the automotive industry where competitive position is measured in parts per hour, this Cleveland Four-Point Press has proven to be a valuable workhorse for a well known automotive manufacturer. Its efficient operation and versatility have resulted in a sizeable upswing of production figures.

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If you are interested in increased press production, in greater press accuracy . . . *make your next press a Cleveland.* Let us help you with your future production plans.

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Established 1880

FABRICATING TOOLS

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Defense commitments are delaying rapid fulfillment of your orders . . . but as always we're doing our best to serve you.

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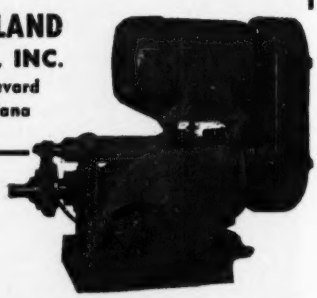


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For any rotary tool operation, build your own special production machines with Millholland Automatic Units. Built in a wide range of sizes, from ¾ to 10 H.P., they give high flexibility and maximum cutting efficiency at low cost. Rugged spindle and bearing design prevents "whipping" and tool breakage under heavy loads. Write for complete engineering data, including electrical and air diagrams, gear ratios and ¼-scale dimension drawings.

DELIVERY — 8 to 12 WEEKS

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At right: Vee Belt Drive
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DOUBLE SAVING!

Multiple tooth cutters give a broaching pull cut that speeds keyway cutting and prolongs cutter life. Davis design makes setting up—even of work tapering as much as 3" per foot—a matter of a few minutes. Here's a DOUBLE SAVING that means a lot, whether you use the Davis Keyseater for varied job work or long run production. One Davis Keyseater and the necessary Davis cutters will produce all keyways up to 14" long, from 1/16" to 1¼" in width.

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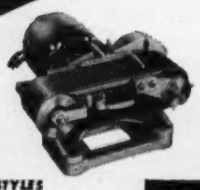


DAVIS KEYSEATER COMPANY
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DOES IT BETTER... DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER

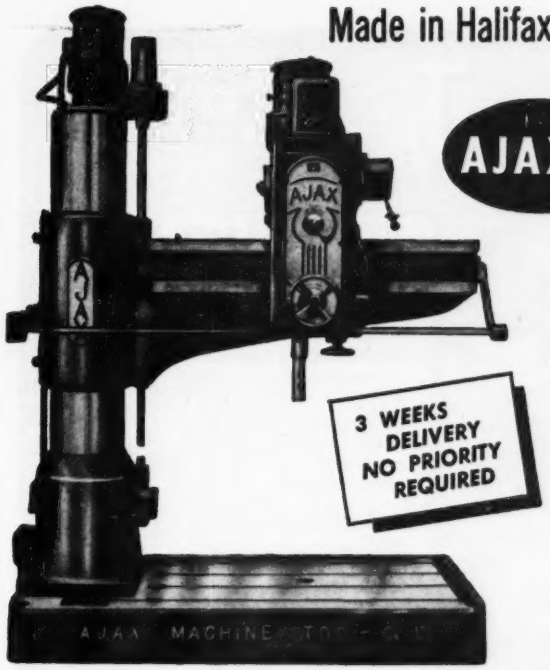


The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

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AJAX RADIAL DRILLING BORING and TAPPING MACHINE

. . . Featuring internal pillar with full length sleeve to eliminate end lift of arm. Extreme rigidity is assured with easy and positive locking arrangements! 3" diameter drilling capacity in cast iron.

The AJAX Radial Drill meets all the demands of the best high speed steel and carbide tipped tools. High quality materials and workmanship together with the utmost ease of handling the centralized controls guarantee a long and trouble-free life.

PARTIAL SPECIFICATIONS

Max. radius of spindle from ctr. of col.	5'0"
Saddle traverse along arm.	3'2"
Baseplate:	
Length of working surface	4'9"
Width of working surface	3'0"
Height of working surface	9"
#4 Morse taper	
Spindle speeds (8)	60 to 1114 rpm

Write today for full specifications.

SALES TERRITORIES OPEN

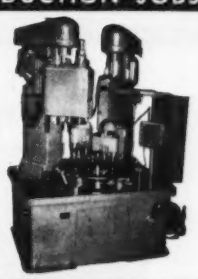
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Manufacturers • Merchants • Distributors
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TELEPHONE: CANAL 6-7400
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KAUFMAN TAPPING MACHINES

BUILT FOR SPECIFIC PRODUCTION JOBS

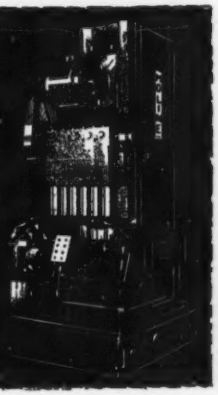
Every machine precision-built to meet the requirements of individual production jobs. Designed with fully automatic cycle, single or multiple spindle heads, and other most advanced features.



Write for complete information

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FOR OVER 50 YEARS
MOLINE "Hole-Hog"
SPECIALLY DESIGNED
MACHINE TOOLS
HAVE CUT PRODUCTION COSTS
FOR AMERICAN INDUSTRY

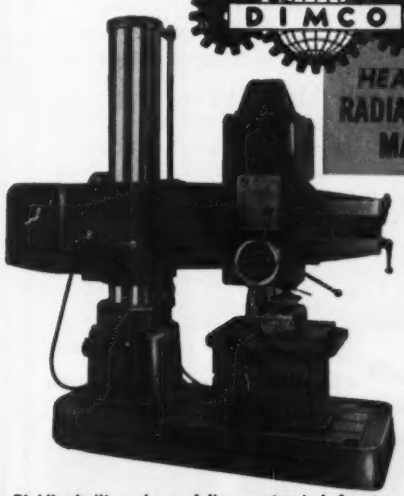


MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

DRILLING
BORING
HONING
TAPPING and
Special Machines

DIMCO

HEAVY DUTY RADIAL DRILLING MACHINES



★ *IMMEDIATE DELIVERY!* ★ *NO PRIORITIES REQUIRED!* ★

No. TR-1N 4 ft.
No. TR-2N 5 ft.

Rigidly built and carefully constructed for top performance and production economy, these radial drilling machines feature hardened and ground gears of high tensile alloy steel, accurately balanced and precision cut.

PARTIAL SPECIFICATIONS	TR-1N	TR-2N
Drilling cap. in cast iron	2⅛"	2⅛"
Drilling cap. in steel	2"	2"
Max. drilling radius	45⅛"	65⅛"
Vert. travel of spindle	13¾"	13¾"
Spindle speeds (16)	40-1500 rpm	40-1500 rpm

• *Write us for complete information!*

KELVIN SYSTEMS CORPORATION
[illegible] FRONTIER, NEW YORK, N. Y.

K

MANUFACTURERS OF MACHINE TOOLS
RADIAL DRILLS • MILLERS
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COSTS DOWN
WITH Commander
PRODUCTION TOOLS



Adjustable MULTI-DRILL

- Adjustable To Any Hole Pattern
- Drill 2 to 8 Holes at 1 Stroke
- Fits Any Drill Press

Increase production up to 800%—save time, cut costs. Mounted without alterations or special tools. 9" drilling area; centers to ½". Extension Spindles available to increase area to 22½". Special adaptations available.

"the tapper that thinks for its operator"

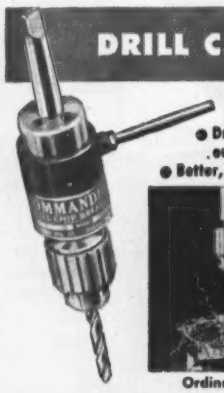


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- Automatic Tap Protection
- Furnished to Fit Any Drill Press

Adjustable full range torque control instantly stops any tap when it's dull, loaded, strikes a hard spot, or bottoms in blind hole tapping. Assures maximum production, cuts rejects, even with inexperienced operators.

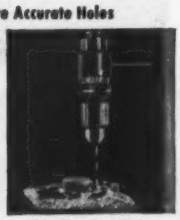
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- Better, Smoother, More Accurate Holes



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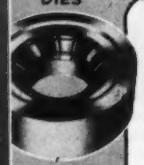


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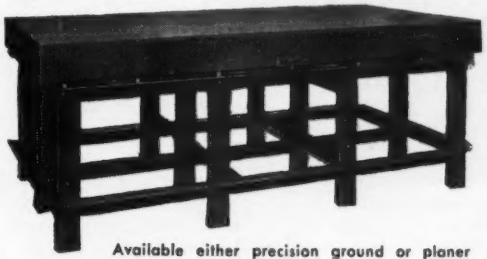
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- CHECKING
- LAPPING
- ASSEMBLY
- WELDING



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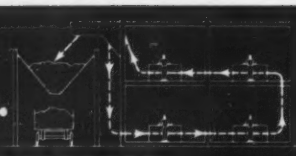


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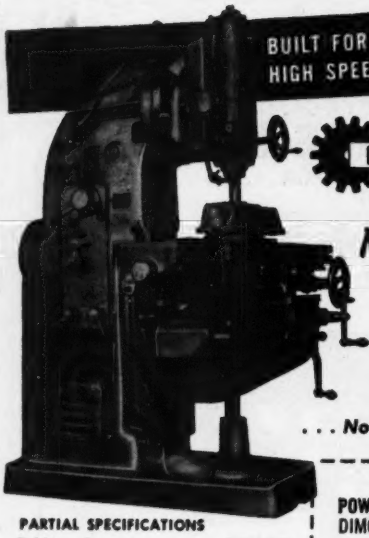
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Cross	11"
Vertical	17¼"
Vert. trav. of spindle	6⅝"
Max. dist. spindle to table	19⅝"
12 spindle spds.: Range	16-650 rpm
9 table power feeds rates, p.m.	
Long. & cross	3⅛-133¼"
Vertical	5/16"-9⅝"
Quick power trav.: all dir.	37"
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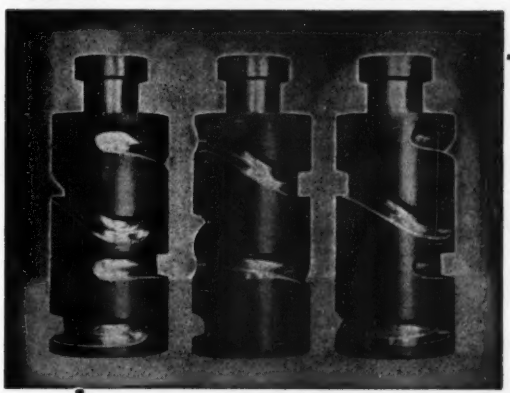
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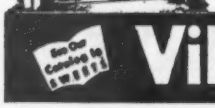
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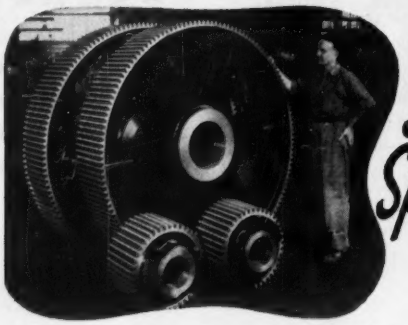


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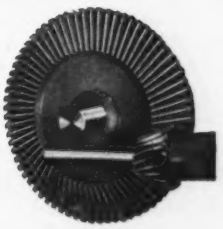
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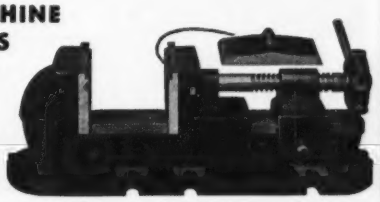
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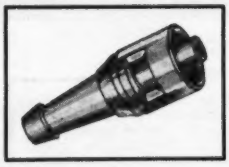


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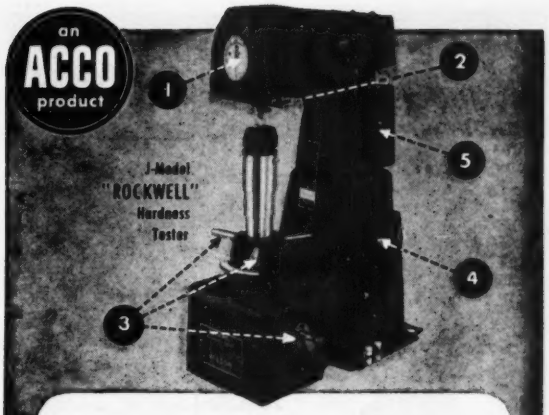


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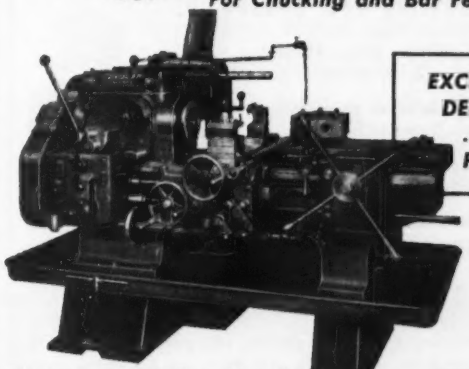
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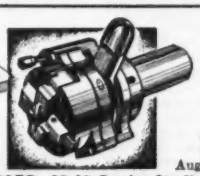
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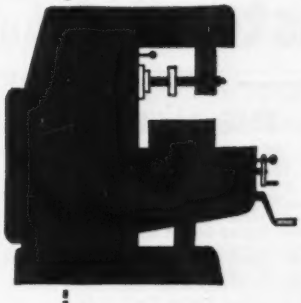
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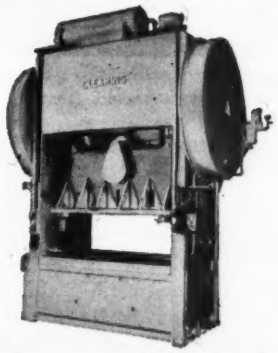
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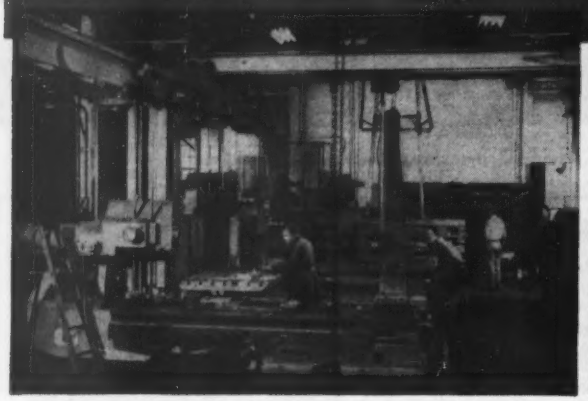
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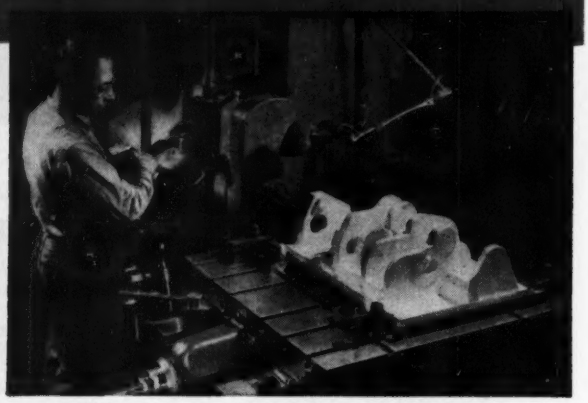
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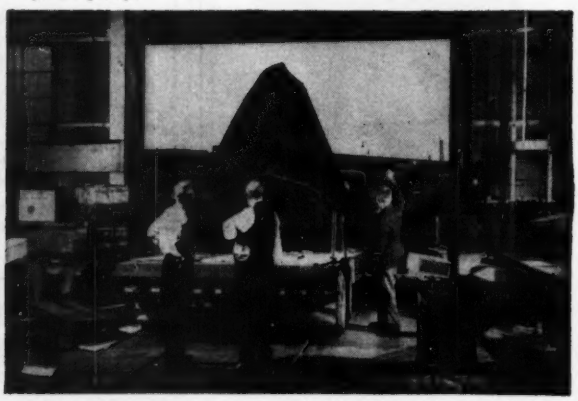
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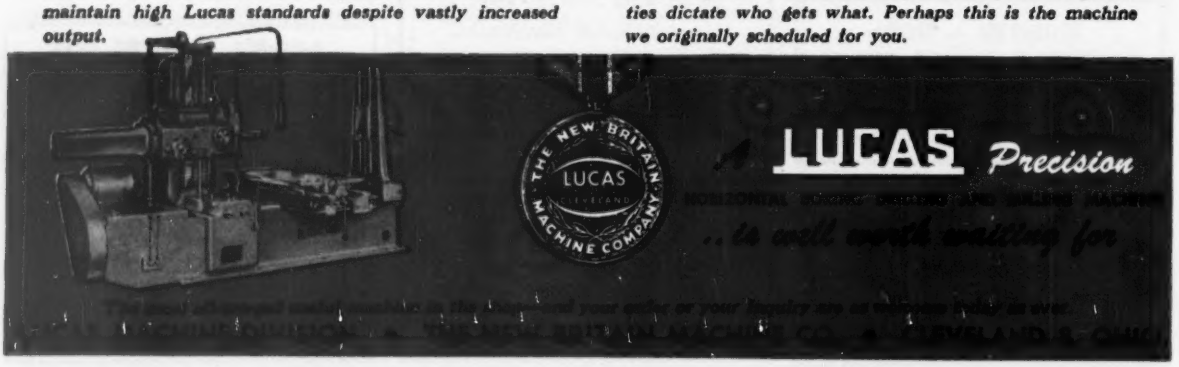
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NEW PRODUCT DESIGNS DEMAND NEW MACHINING METHODS

This New Britain Automatic developed for contour facing jet compressor wheels

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES



NEW BRITAIN

Automatics

THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

New lathe for facing jet engine disks gets precision with TIMKEN® bearings

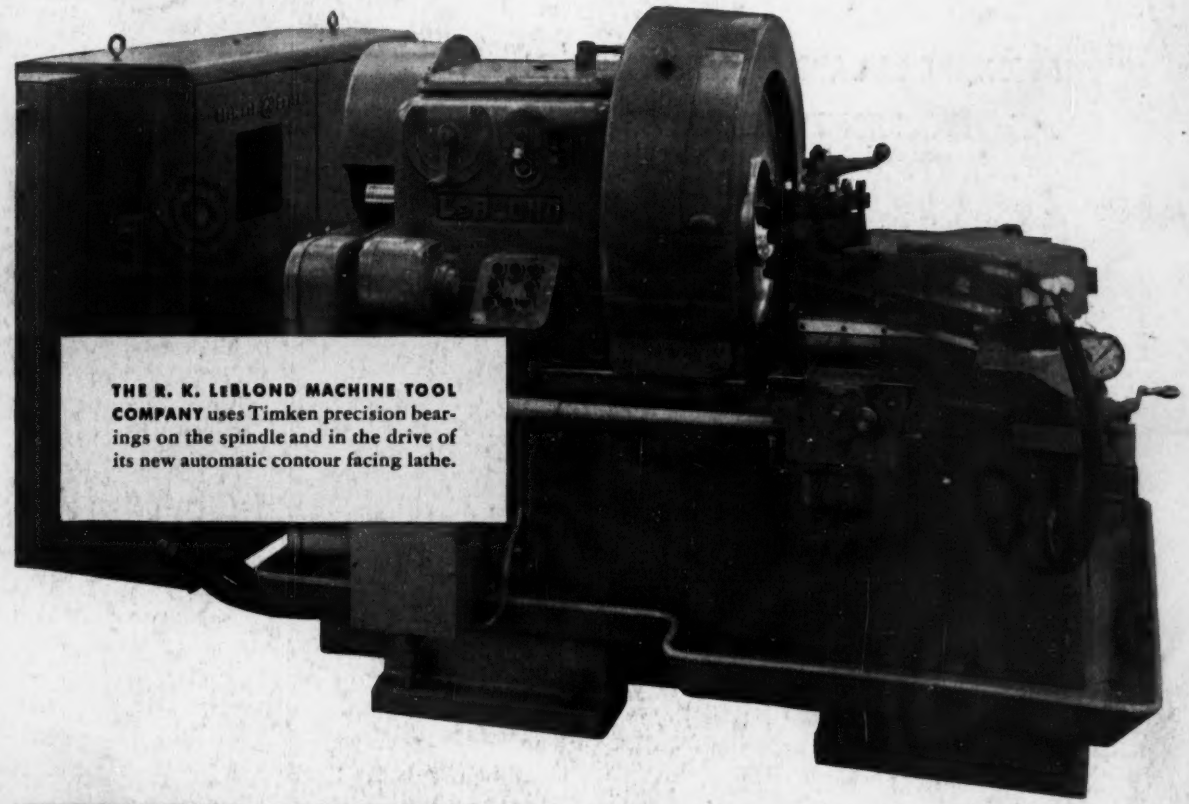
THIS new LeBlond automatic contour facing lathe is especially designed for machining compressor and turbine disks for jet engines. Outside shoulders of the disk contours are machined when feeding from front to center and inside shoulders are machined when feeding from center to rear. To accomplish this, the spindle automatically reverses when the tool reaches the center. And the lathe gets high precision with Timken® precision bearings on the spindle and in the drive,

Timken precision bearings are made especially for spindle applications; their run-out tolerances can be held as close as 75 millionths of an inch. The tapered design of Timken bearings enables them to take radial and thrust loads or any combination, holds spindles in rigid alignment. It also permits pre-loading to any desired degree to prevent chatter. Line contact between the rollers and races of Timken bearings gives them adequate capacity for any tool loads.

LeBlond has found that Timken precision bearings are easy and less costly to assemble because they're tapered in design, eliminate the need for auxiliary thrust bearings. Spindle maintenance is simplified.

Timken precision bearings have been an important factor in the development of precision machine tools for the past 25 years. Make sure you have them in all the machinery you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



THE R. K. LEBLOND MACHINE TOOL COMPANY uses Timken precision bearings on the spindle and in the drive of its new automatic contour facing lathe.



FINISHED TO CLOSER TOLERANCES

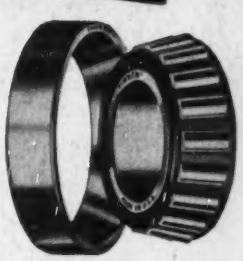
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬭ AND THRUST →⬭← LOADS OR ANY COMBINATION